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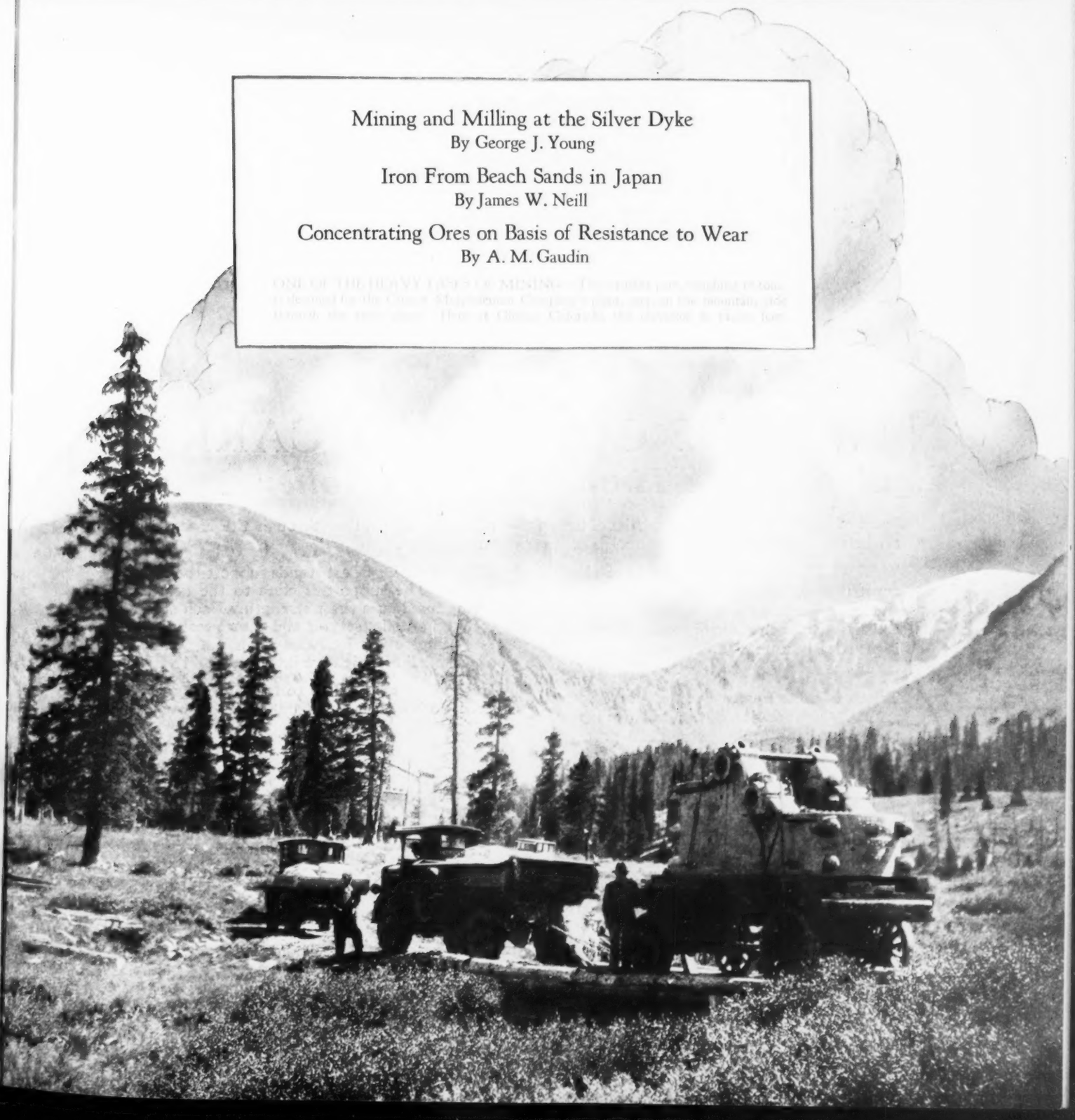
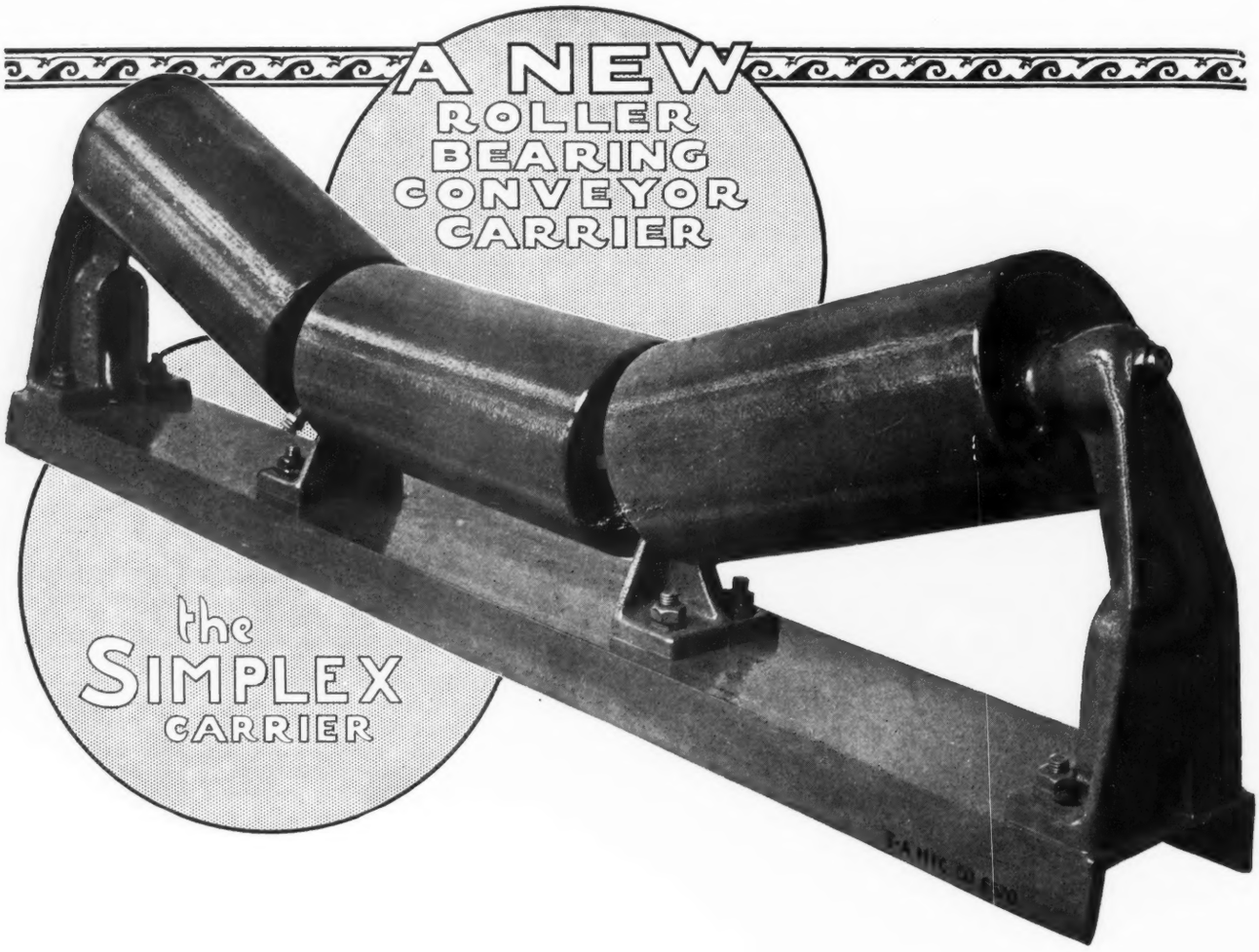
By George J. Young

Iron From Beach Sands in Japan
By James W. Neill

Concentrating Ores on Basis of Resistance to Wear
By A. M. Gaudin





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Contents

*Illustrated Article

Editorials 233
- Our Annual Review Number
- Confirmation of Mexican Oil Land Titles
- Quicksilver Mining in the United States
- Flamboyancy—Otherwise Flim Flam
- Morale in Industry
- Dividends on Ventilation
- Workers for Pay, and Otherwise

*Novel Mining and Milling Methods at the Silver Dyke Property at Neihart, Mont. 236
By George J. Young

Liability for Premature Explosions 242
By Leo T. Parker

*Making Iron From Beach Sands in Japan 243
By James W. Neill

Resistance to Wear a Basis for Concentrating Ores 245
By A. M. Gaudin

Useful Operating Ideas 247
- *Aligning Raises for Connections
  By G. H. Parker
- Wooden and Wax Primers
- *Special Tool for Recovering Churn-Drill Tools
  By Roy H. Poston
- *Trolley Wire Guard
  By E. H. Oneal
- *Repair to Adjusting Setscrew
  By Charles Labbe

Professional Directory 37-39

Searchlight Section 40-42

Discussion 249
- A Mexican Incident
- Petroleum Recovery
- The Situation in Mexico
- Cyanide Plant Control
- As a Prospector Sees Mining

Consultation 252
- Lubricating Hoist Brake Blocks
- "Force Majeure" in Smelting Contracts
- The Source of Salt
- Bolivia Tin for Solder

Mining News 253
- Custom Mines for Idaho
- Anaconda-Carson Suit
- Spanish Iron Mining Depressed
- Belgian Smelters and Idaho Lead
- News From Washington
- Letters From Toronto, Mexico City, London and Johannesburg

Societies, Addresses and Reports 260

Men You Should Know About 261

Obituaries 261

Recent Technical Publications 262
- A Geological Guide to Central Chile
  By F. R. Koeberlin

New Machinery 263

Market and Financial News 265

Market Report 267

Metal Statistics 271

Mining Stocks 272

What and Where to Buy 44-46

Advertising Index 48

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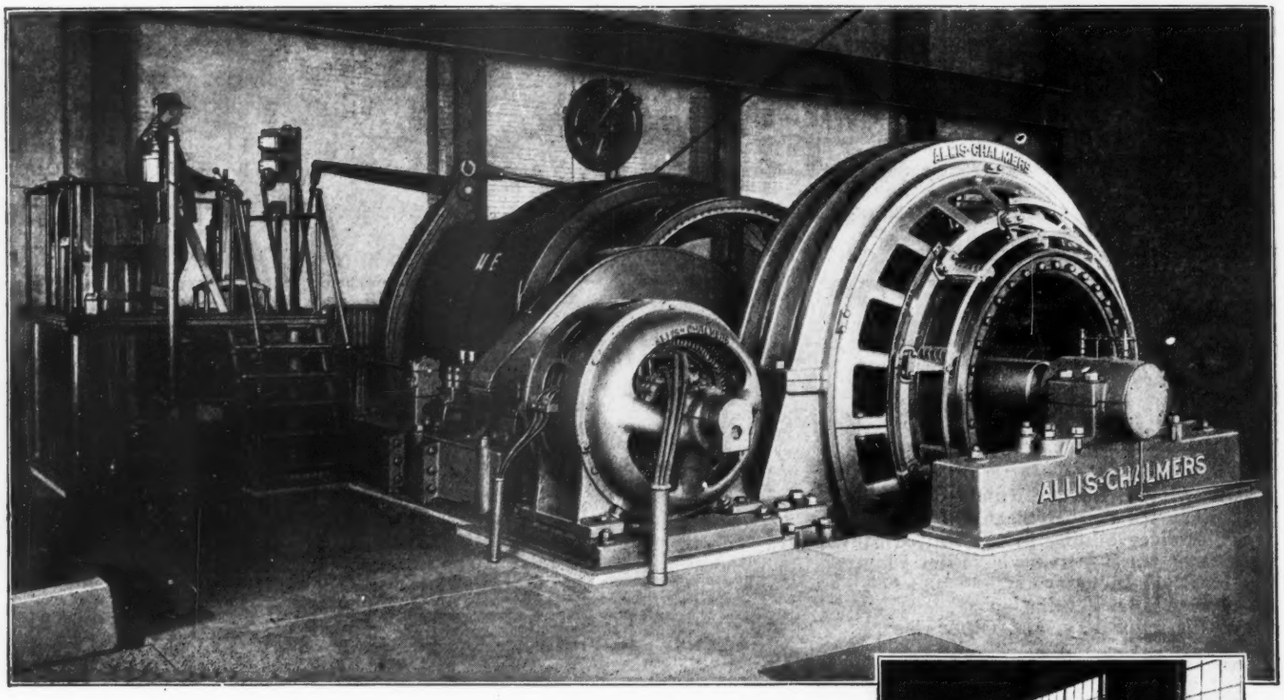

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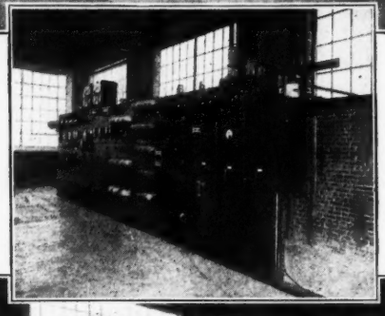

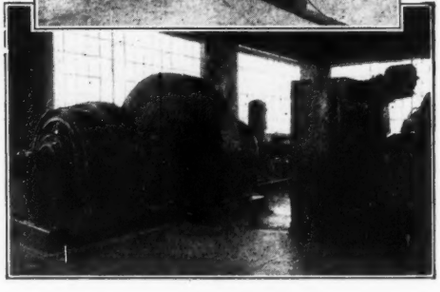

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ENGINEERING AND
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JOSIAH EDWARD SPURR, Editor

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Our Annual Review Number

LOOKING BACK to the Annual Review number, the principal feeling is of appreciation of the co-operation of the mining industry which makes possible such a rounded and authoritative review—a co-operation evidenced by the many who take their valuable time to contribute, and the many more who have given freely of their information, but who do not appear in our list of contributors. Declination of a request to contribute for the Annual Review number is all but unknown, and when it occurs it is for evident reasons of necessity. The issue is therefore not a work of the editors, but a forum of authorities representing the different phases of the industry: so that, after looking it over, one may feel that he has the best analysis obtainable.

The frontispiece—the labor of Mr. George J. Young, special editor of the Annual Review number—is sure to attract continued study and attention, as was the case with the zinc chart of a year ago, also by Mr. Young, and the copper chart of two years ago, by Mr. Wormser. These striking depictions, a student of statistics observed, really represent a new discovery in graphs; and are surprising and illuminating as to the localization, trend, and volume of these mineral industries. Again we must not forget to acknowledge indebtedness to the companies which gave us their private data, to be merged into this general picture.

Confirmation of Mexican Oil Land Titles

ARTICLE 47 of the Mexican law of May 3, 1926, states that there will be confirmed without any expense whatever "the rights covering carboniferous exploration or exploitation, or of those substances which are the object of the diverse mineral industries . . . contracted for prior to the date of May 1, 1917." There is nothing unreasonable in this requirement, as it guarantees to the government, as well as to the public, that the exploiters of mineral resources are bona fide owners or concessionaires and have the legal right to extract mineral substances.

The regulations administering this act are as simple as the act itself. If the applicant is the owner his application for confirmation of ownership must have attached the original and simple copy of (1) "the deed of ownership"; (2) "contracts entered into with a third party for the express purpose of carrying into effect some of the exploration or exploitation operations"; or (3) "the authentic proof regarding the property whereon was started the works of exploration or exploitation."

If the applicant is not the owner of the land, he must submit original and copy of (1) "the instrument or contract whereby there may have been expressly covenanted the exploration or exploitation of the subsoil," or (2) "the documents which may substantiate the date on which were inaugurated the works of exploration and exploitation."

All of the documents mentioned must be inscribed in the Public Register of Property in the name of the applicant prior to the date of application. Article 48 specifies that these titles so confirmed shall extend for fifty years "from the date of the primitive contract," or "from the time that were first started the works of exploration or exploitation." Extensions beyond fifty years may be granted "provided the beneficiaries may have complied with the obligation to establish regular works."

Article 49 of the law refers to "contracts, permits and concessions granted by the Executive of the Union" which will be confirmed without cost, provided there is attached to the application for confirmation, the original and simple copy of (1) "the present title in force," (2) "the instrument of conveyance duly legalized," in case the applicant "may not be the titulary of the concession"; (3) "certificate of the Registry of Commerce" regarding the number of concession units or pertenencias, and (4) "the certificate showing that taxes have been paid to date" of application.

In the event that owner or concessionaire does not comply with the law and regulations as above cited, he is understood to have "renounced the rights that he may have had" to the land, and it "will be added to the lot over which it may be placed, or it shall be concessible if the land supporting it is free." The law says nothing about confiscating any property. By not complying with the law, automatic renouncement of rights and privileges is assumed.

There does not appear to be anything in the law or regulations to prevent any owner or operator from securing the confirmation of title when asked for. It is to be assumed when application is made that he has a good title of record, that he is actually the bona fide owner or concessionaire, that his property boundaries are properly recorded, and that he can produce tax receipts. It is possible that some operators may not be able to produce the few documents required, and in that event, of course, would arise the question of authentic title, the very question that the government desires to validate.

Recent investigation by Commander George Barr Baker, former associate of Herbert Hoover during the World War, according to a report published in the *New York Evening Post* of Jan. 25, revealed the following facts: The total acreage owned or controlled by 666 foreign oil companies acquired before May 1, 1917, is 28,500,000. Of the 666 foreign oil corporations, 644 have complied with the law, and 22 have refused. The acreage of the 22 companies not complying with the law is reported as 1,600,000, or about 6 per cent of the total.

Of this latter amount one American owns or controls, so it is reported, 750,000 acres, or 46 per cent. According to court records, leases secured by this individual in the United States have been declared invalid. Since it is reported that 96 per cent of the foreign oil corporations have complied with the law, why should three or four large American companies and their subsidiaries refuse to comply, especially if their titles to holdings will bear the searchlight of a legal investigation? The New York *World* says, "the heart of the opposition is the same group of men who engineered Teapot Dome and Elk Hills leases . . . and defrauded the United States Government out of its most valuable oil properties." They are now engaged in a quarrel with the Mexican Government about some other oil properties, and expect the United States to defend them in their refusal to comply with the law of the land in which they choose to do business. It is time enough to interfere after they have complied with the law, and find that good titles have been abrogated. If titles are good there is every reason to believe they will be confirmed.

Quicksilver Mining in the United States?

THE UNITED STATES may possibly become a larger producer of a metal for which it has, in the past, been responsible for only a small part of the world's supply. It is rather a novelty, in these days of gradually declining commodity prices, to find a metal that is now selling for the highest price reached at any time since the World War; whose price has advanced almost continuously for the last six years; and whose prospects are such that present prices are likely to be maintained for a time if not increased further. Even at the peak of war demand, the price of quicksilver never got much above $125 a flask, except for two or three months at the beginning of 1916; it is now firm at slightly above $100. The pre-war price was less than half this.

The firmness in this market has been occasioned by a lack of increased production rather than by greatly increased demand. Production has remained virtually static at but little over 3,000 metric tons a year, for the last five years; the average for this period is probably less than the average for 1913 and 1914, in spite of the higher prices. But at $100 a flask or more, some small properties are likely to be developed, and possibly this may serve to put a brake on further price advances of moment.

It is rather a general impression that Spain is the principal producer of quicksilver, an impression apparently shared by the editor of a Western contemporary, who has a story in his latest issue headed "Spain Principal Source of Mercury." As a matter of fact, Italy is the principal producer, with its important Idria mine, at Carniola, and properties in the Monte Amiata district. Spain comes second, the production coming chiefly from the Almaden mine. There is no open market for the European production, which is closely controlled by interests that probably charge all that the traffic will bear. This is an element of weakness in the situation so far as outside producers are concerned, as one has no way of determining how far present prices are justified. On the other hand, such close control may inure to the benefit of scattered small producers, provided they do not take advantage of their protection and produce too much!

The United States has for years been only a small factor in world production, accounting for something like 10 per cent of the world's total, largely from Texas and California mines. Certain other states, especially Arizona, Oregon, and Idaho, have quicksilver prospects, some of which are already producing, and a great deal of activity is going on. Fortunately, very low-grade ores may be profitably worked, and the process of recovering the quicksilver is simple; it has all been explained in a recent bulletin of the U. S. Bureau of Mines —No. 222. A complete plant may be erected at the mine, and nothing remains but for the operator to sell the finished product.

Should the world production of the metal be increased, maintenance of present prices is a matter of some doubt, as consumption has not expanded to the extent that it has for many other metals. Electrical uses have increased, but the largest potential use of quicksilver is in the Emmet mercury boiler. Latest reports indicate that this is still in the experimental stage and that it is too early to count on any consumption of quicksilver for this particular purpose. Holders of quicksilver properties, therefore, would be well advised in not investing too heavily either in mine development or in equipment for ore reduction, though the present condition of the market certainly warrants a reasonable amount of work in opening up new properties, especially where there are indications of high-grade ore that might allow competition with established mines, even at low prices. Among the old producers, the Almaden is going strong at the end of 2,000 years' operation, but the Idria mine is nearing exhaustion, and, as the matter stands at present, with its demise the burden of production will fall upon Spain.

Flamboyancy—Otherwise Flim Flam

EXPERIENCE TEACHES that flamboyancy in mine promotion is a fair index of the honesty of the enterprise. Some will take exception to this, but in general it is true. Enterprises that have proved honest, even though unsuccessful when it came to finding ore, have generally been promoted in a conservative manner. On the other hand, notorious swindles have generally been put before the public with extravagant statements and promises marked by a scant respect for truth. It has been argued that flamboyant circulars are justified because it is impossible to get the lay public to buy on the strength of a statement of sober facts. "Leave it to us," such circulars say. "There's all kinds of ore and you cannot possibly lose. Wasn't Nipissing a winner and isn't Henry Ford a millionaire?" Many are simple enough to be tempted into biting on no better bait than this. Conceivably an honest enterprise might be put before the public in some such flamboyant way. At once, though, it would find itself rubbing elbows with some very hard-looking fellows. It is difficult to imagine virtue donning vice's raiment.

For some time past, the stock of a certain property in Sonora has been offered to the public. Extravagance of statement and paucity of fact as to what the company really has are the principal characteristics of the promoter's literature. Various expedients are resorted

to to make the stock attractive. Recently shares were offered at, say, $1.50, with the guarantee that the comuany would repurchase them within six months at $1.75. Possibly the company will make this promise good, and charge its loss to advertising, if there be a loss. Permissible though this may seem to some, it surely does not help the enterprise in the eyes of wary people. On the other hand, it may lead the unthinking to risk their possibly scanty surplus on what is undoubtedly a far longer shot than they imagine.

Morale in Industry

DURING THE WAR a French word pertaining to psychology—"morale"—became part of everyday language, being indeed currently clipped in pronunciation to "morél"—which is quite different, being a mushroom. It was recognized that troops, perfectly fed and equipped and possessed with the ordinary amount of courage, were efficient or not in proportion as they possessed that evasive, intangible poise of the spirit called morale—with which ill-equipped and ill-fed troops would go to victory. To sustain this cheerful and optimistic spirit was the study of the general staffs.

Since the war the word has not been heard so much, like other words which denote things which the sharpened intensity of war brings out strongly. Nevertheless, the idea of morale is proportionally as important in peace—in industry, government, politics, social problems—even the family. Cheerfulness, reasonable optimism, good-will—these are all powerful forces which make toward efficiency and happiness and the abolition of strife. With the attainment of this morale, labor problems fade away, labor turnover shrinks, production increases, wages go up. Remove it, and the life of any industrial structure vanishes, leaving an inanimate and mechanical framework.

> "Your merry heart goes all the way;
> Your sad tires in a mile."

Leaders of industry, captains of enterprise, should consider this as carefully as military commanders found they had to do in time of war. The main essential to efficiency in business is morale—just as it is in the more unusual tasks and accomplishments of life. Invention, art, literature, all wait upon the inspiration that comes to the serene and properly attuned spirit, upon the moment of high "morale."

Dividends on Ventilation

"WHY PAY HIGH SALARIES to competent help and then bludgeon them into semi-consciousness with foul air?" is the somewhat extravagant advertisement of a manufacturer of an office ventilator. Extravagant it is, but still it has a sermon. Many a mining company equips its mine, surface and underground, with up-to-date machinery—everything as good as circumstances demand. Powder, steel, pipe, and timber are also all given due consideration, and efforts are carefully made that supplies required may always be at hand when needed. One important thing, however, is often overlooked, and that is oxygen. Just as the rock drill machine needs proper air, so does the human machine, and the company that lets bad air conditions underground go neglected pays for it in dollars lost through lost efficiency and time.

Where these conditions are generally bad they are likely to be corrected. But it is the occasional stope or heading where air is bad that is apt to be ignored. In one stope in a certain Utah mine the shift was four hours long—a day's pay for a half day's work, and the men who worked there needed it, for they were "all in" when this short shift was over. And this is no unusual thing, as every miner knows. Once it was hard to remedy this condition, but it is now possible to get fans to suit any conditions underground. The complex conditions of secondary mine ventilation cannot be met efficiently by one type of fan, so on the market the mining company that needs it can find medium-pressure volume-type blowers for short ducts of large diameter as well as blowers giving comparatively high static pressure and suitable for small ducts of say 1,000 ft. or more in length.

There is little excuse today for bad air underground. Provision for good air should be a prime requirement and not an afterthought. Men will stay longer and the investment will at least return its cost.

Workers for Pay, and Otherwise

THAT PROSPERITY PROMOTES LEISURE is shown by recent statistics. In 1910, in the United States 41.5 per cent of the population were working for a living; but in 1925 only 37.5 per cent fell into the busy-bee category. This is according to a recent report of the National Industrial Conference Board, which observes, "Less than four out of every ten persons in the United States in 1925 were working for a living. The other six either were living on the returns on their investments, or were being supported by others or at public expense." In 1920, 39 per cent of the population were working. Comparing this with other countries in the same year, we find that in Germany 56.6 per cent were working, 53.3 per cent in France, 46.8 per cent in Italy, and 44 per cent in Great Britain and Ireland. The Netherlands and Denmark, however, showed a lower proportion of workers than the United States, or 37.7 per cent. These little countries, it will be noted, stayed successfully out of the war, showing that the warring European nations are paying for the war in toil.

The large percentage proportion of non-workers does not mean idleness, but freedom from poverty. Increased numbers at school and in college are largely responsible for the low percentage of workers for pay in the United States, and doubtless in the little European countries mentioned also. Another factor in reducing the number of pay-earners is doubtless due to the service of the "mechanical slaves," which enable the workers to produce more largely, earn higher pay, and so support the youth and the old, or to retire on accumulated savings.

Among the workers 2.7 (of the total number of workers) per cent were engaged in mining; while 7.6 per cent were occupied in transportation; 24.5 per cent in agriculture; and 22.9 per cent in the manufacturing and mechanical industries. Non-industrial pursuits employed 35.3 per cent of the workers. As against 1910, agriculture shows a decline of 29.9 per cent to 24.5 per cent.

The figure of 72,470,000 persons in the United States not gainfully employed is somewhat astounding: but the corresponding figures for Denmark and Holland show the normalcy of this in prosperous times and countries.

Novel Mining and Milling Methods at the Silver Dyke Property at Neihart, Mont.

By George J. Young
Associate Editor

MINING ENTERPRISES afford wide variety in situation, ore types, methods, and economic conditions. Low-grade deposits are of peculiar interest in that the narrower the margin the more critical becomes the selection of methods, the more great is the need for skill in operation, and the more vulnerable becomes the enterprise with respect to fluctuating metal prices and changing conditions. The Silver Dyke property, near Neihart, Mont., is an example of a low-grade deposit of considerable size that is now being operated chiefly because of foresight in the selection of methods and the availability of modern equipment. It is on Carpenter Creek, in the Little Belt Mountains,[1] about 5 miles from Neihart.

The mine is high up on the slope of the mountain above the forks of Carpenter Creek, the altitude of the lower adit being 6,870 ft. A good road connects with the Interpark Highway and the railroad loading point 3½ miles distant. The mill is on the exposed side of the mountain above the village. The region is forested with jack pine and is typical of the Montana uplands. For about four months of the year good weather prevails, but the remainder of the year is changeable and the winters are usually severe. The nearest general supply point is Great Falls.

Wide Zone of Low-Grade Ore

Small, rich silver veins were discovered in the Neihart district in 1882 and have since been worked at different times. The Silver Dyke deposit represented a wide zone of oxidation and mineralization essentially different from the silver veins nearer Neihart. Exploration and development began in the summer of 1921 and construction in the fall of 1922. Operation was started in February, 1923, and the next two years were a period of adjustment. Control of the property is retained by the American Zinc, Lead & Smelting Co. H. I. Young is manager of mines and D. I. Hayes is resident manager of the Silver Dyke Mining Co.

The orebody is a partially altered quartz porphyry and gneiss breccia surrounded by granite gneiss on one side and unaltered porphyry on the other. The valuable minerals occur along fractures in a highly brecciated mass. Alteration has proceeded to such an extent that about 20 per cent of the ore mass is kaolin and its closely related associates. Both oxidized and sulphide minerals are present, disseminated more or less uniformly within an area which has been delineated by boring. The plan of the orebody is roughly elliptical, with a maximum length of 600 ft. and a width of 400 ft. The vertical range commanded by the present adit workings at 6,870-ft. altitude is from 250 to 300 ft. More or less stripping has been done, and the surface has been cleared of the forest growth.

Underground development was extended from two adits at different elevations. At present the lower adit is used for working purposes. This is about 1,000 ft. in length, 5 ft. wide at the top, 6½ ft. at the bottom, and 7 ft. high. A 36-in. gage track has been installed, and connects to four or more parallel drifts at about 80-ft. centers. Two of these drifts are joined at their further extremities by a run-around. The others are dead ends, which will be extended as they are needed.

Loading chutes are spaced at 25-ft. intervals along the drifts. Two types of chute construction are in use, either being used as the conditions justify. One consists of a pair of loading chutes, side by side, connecting with a small pocket beneath a grizzly which is about 24 ft. above the rail top. Above the grizzly is a bulldozing chamber connecting with a short 45-deg. slope to the vertical raise, 5 by 5 ft. to 7 by 7 ft. The vertical raise is almost directly above the main drift. A narrow manway drift connects the bulldozing chambers and is reached by a ladderway at the side of the chute structure.

Details of Chute Construction

Fig. 1 shows the details of design. The other chute structure is shown in Fig. 2. This consists of two pairs of chute gates, one pair at each side of the main drift. A pillar above the drift divides the ore pockets, but the grizzlies form a continuous opening above. Vertical raises at from 30- to 40-ft. centers discharge upon the grizzlies and are symmetrically placed as shown in the figure. The outline used as a guide for the miners is shown in Fig. 3. Chute structures are placed

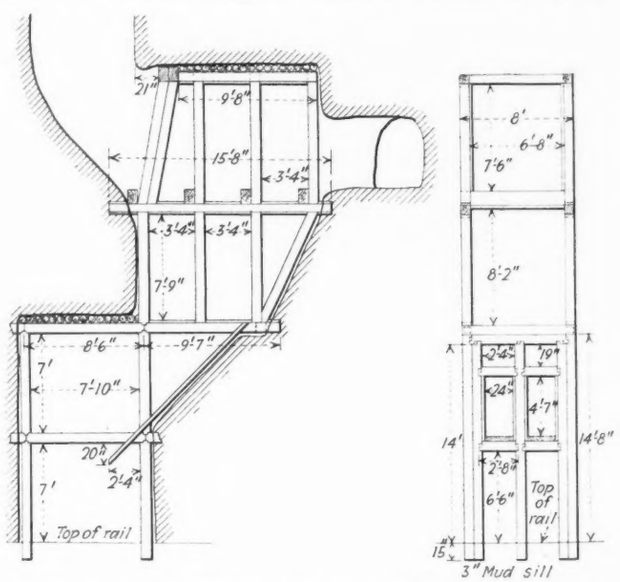


Fig. 1—Single-pocket loading chute and bulldozing chamber

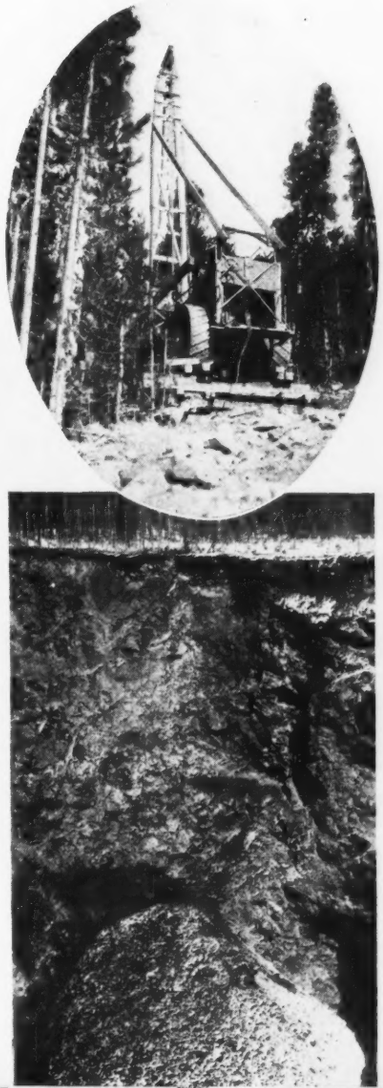
at the lower horizon of the mining operations. A gate similar to the quarter-pan type is used. A control board held by angle-iron cleats is placed above this gate. Compressed-air blowpipes are used at the chutes.

[1]The Little Belt Mountain Quadrangle is described in Folio 56, U. S. Geological Survey.

Scenes at Silver Dyke

A view of the open pit at the mine

To the right, a glimpse of the pit in winter time



Steam shovel and drilling outfit

In the oval is a churn drill, mounted for the sake of portability

Stripping equipment is shown above; to the right is the waste dump

Above: Snow does not deter shipment of concentrate by motor truck

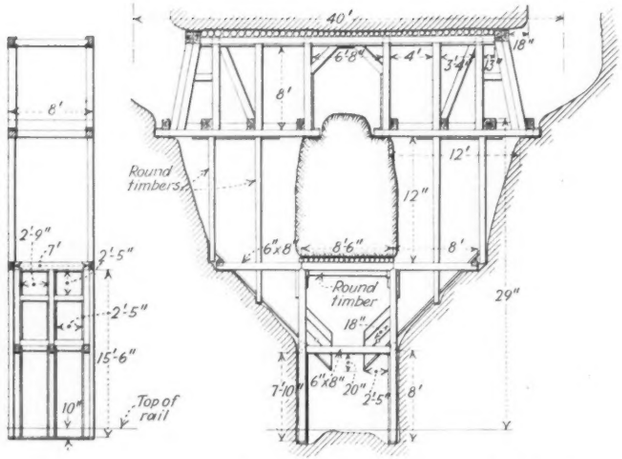


Fig. 2—Double-pocket loading chute and bulldozing chamber

Two methods of mining are now employed, one being by open pit during the summer months and the other being "under cover" and restricted to the winter months or when excessive rainfall interferes with open-pit operations. Because of the clayey nature of the ore and its sticky properties, the open-pit mining departs from the usual glory-hole practice. The open pit was started from two pairs of vertical 5 by 5-ft. raises 100 ft. apart and 35 ft. on centers. These raises are connected with double loading chutes. Each raise was reamed out to 15 ft. in diameter by retreating upward. The broken ore was removed promptly from the chutes to prevent packing and hang-ups. Thereafter the pit was extended by blasting deep churn-drill holes spaced about the periphery of the vertical walled pit.

Churn-drill holes are given a burden of 10 ft. at the start, and as the pit expands the burden is increased up to 20 ft. Horizontal spacings range from 15 to 25 ft. A hole will break from 1,000 to 1,500 tons. The deepest churn-drill hole blasted to date was 265 ft. Holes are 6 in. in diameter and are cased with Perfection galvanized-iron casing at the collar to a depth of 10 to 20 ft. In open-pit blasting the lower 120 ft. of a drill hole is blasted, the charges of explosive, 6 to 8 ft. in length in a given hole, being separated by plugs of soil stemming 10 to 15 ft. in length. Amite explosive in 30 and 40 per cent grades is used in cartridges 4 by 16 in. Gelatin explosive, very low freezing, in 30 and 40 per cent grades, is also used. The cartridges are dropped in and are cushioned by the air as they fall. Short cartridges were found objectionable because they stuck in the holes. The 16-in. cartridges do not do this. A slight thud indicates the seating of the cartridge upon the explosive already in place. A pine tamping stick 4 in. in diameter and 7 ft. long, attached to a rope and operated from a tripod placed over the hole, is used to consolidate the stemming. Double-taped cordeau-bickford fuse detonates the charge.

ELECTRICALLY DRIVEN CHURN DRILLS

Churn-drilling equipment consists of one No. 5½ Keystone and one Sparta rig, both being operated by a.c. variable-speed electric motors, the former by a 20-hp. motor and the latter by one of 15 hp. A heavy stem, jars and bit, 30 ft. in length, are used. The bit diameter is 5⅝ in. On account of the soft, brecciated character of the ground, careful drilling is necessary. The drilling rate is 25 ft. per ten-hour shift, and costs range from an average of 92c. per foot down to 66c.

The pit walls are vertical, the churn-drill holes breaking in such a way as to leave their mark upon the wall. Pit edges are sharp, with no noticeable cracks or back breaks. By maintaining a circular outline to the walls, a greater self-sustaining effect is obtained. Occasionally peninsulas, or noses, form near the bottom of the pit, and when there is sufficient tonnage in them to warrant the necessary development work, they are caved by retreating undercutting. A feature of the work is the prompt drawing of the broken ore.

Winter operation is impracticable, because water in the workings and apparatus freezes and thus makes drawing the broken ore difficult.

No work is done in the pit bottom, oversize being handled in the bulldozing chambers at the draw points. Some ten draw points are now in operation, and this enables grade control to be maintained. The vertical hole gives a single slice from top to bottom; the various draw points give horizontal distribution from different parts of the orebody.

INGENIOUS METHOD OF "UNDER-COVER" MINING

Underground mining can best be described by an example. A series of ten pockets, with accessory bulldozing chambers, grizzlies, and chutes, is constructed tributary to two drifts and the connecting run-around. The ore block is roughly half elliptical in plan (Fig. 4). From the vertical chute raises which extend upward a short distance, 45 deg. raises are extended and meet above the center of the drift. Three shrinkage stopes, each 20 ft. wide and separated by vertical pillars, are started and extended upward to a height of 60 ft. The stopes are 60, 50, and 60 ft. on length, the total length, including pillars, being 225 ft. As soon as completed they are drawn. Outside the outer stope limits a series of churn-drill holes are drilled, spaced horizontally 25 ft. and 20 ft. from the wall of the stope. They extend to within 15 ft. of the grizzly level. This condition is shown at *A*, Fig. 5.

The lower sections of the churn-drill holes are blasted as ore is required, and the broken ore is drawn off as completely as possible. The effect of these blasts is to widen the stope, and to start side and top sloughing. Certain drill holes are so placed as to break out the pillars between the stopes when desired. When this stage is completed, as shown at *C*, Fig. 5, the stope width is 40 ft., the top is arched, and the stope is horseshoe shaped, inclosing a pillar.

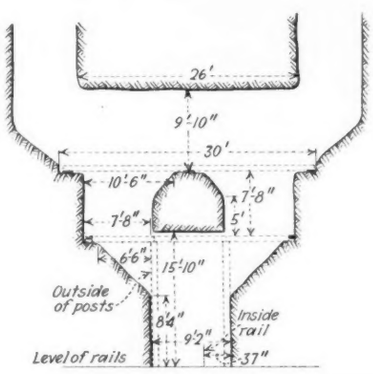


Fig. 3—Rock limits of double-pocket chute and bulldozing chamber

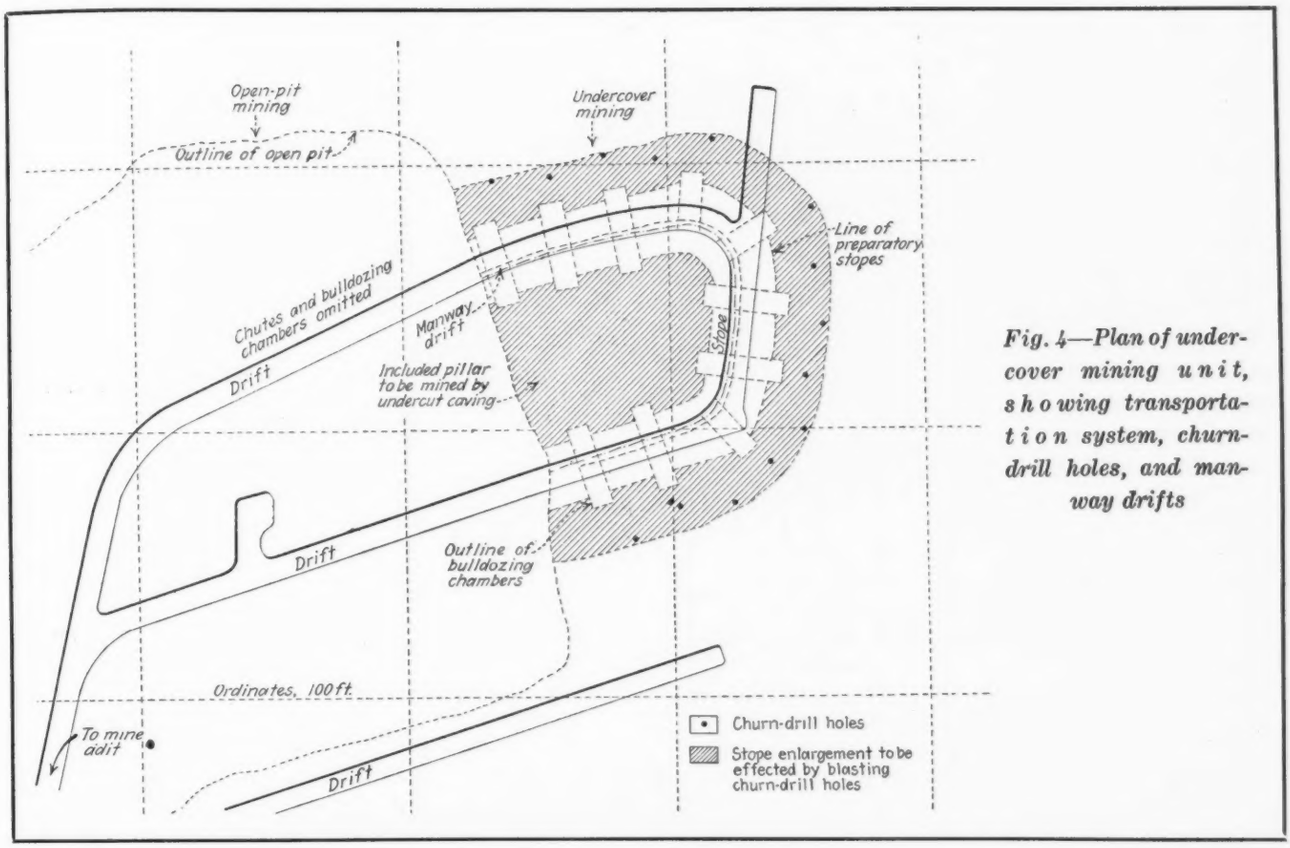


Fig. 4—Plan of undercover mining unit, showing transportation system, churn-drill holes, and manway drifts

A series of downwardly inclined, undercutting crosscuts is next driven in the pillar at 25-ft. centers and in a plane about 40 ft. above the grizzly level. The inner sides of the open stope are drilled from these crosscuts and blasted out. The undercut starts caving of the side walls, and this progresses upward, reaching the arched roof and weakening it. Undercutting is continued, retreating backward from the inner wall of the original stope. Eventually the inner pillar is completely undercut and the full width of the resulting arch becomes about 140 ft. This caves to the surface. The resulting pit can be extended by churn-drill holes.

Mining Costs Down to 42c.

Combination of shrinkage stoping, blasting by churn-drill holes, and undercut caving is distinctly novel, as is also the use of deep churn-drill holes and vertical stabbing in the open-pit work. Average cost of mining over the last eight months was 42c. per ton, which included management and overhead, but does not include development, which is about 30c. per ton. Upon a tonnage of 700 tons per day the costs are very low.

An Imperial Type 10 compressor of 800 cu.ft. capacity supplies compressed air for drilling. At the tunnel portal are shops for drill sharpening and repair work. A four-ton trolley locomotive is used for haulage. A 35-kw. motor generator supplies 250 volts d.c. for trolley service. Average haul approximates 2,500 ft. underground. Cars are bottom-dump type with Whitney roller bearings and are of 3½-ton capacity. Nine make up a train, and in all fourteen cars are available.

A Difficult Ore to Treat

The ore is unusual and approaches the complex type. Both oxidized and sulphide minerals occur. The valuable minerals are galena, cerussite, chalcopyrite, malachite, azurite, pyrite, and iron oxides, with sphalerite in small amounts. Identity of the silver mineral has not been determined. Gangue consists of altered quartz porphyry and gneiss, the ore containing about 20 per cent of colloidal material, principally kaolin. Heads contain 0.78 per cent copper, 1.56 per cent lead, and 4.48 oz. of silver per ton. Tailings average 0.22 per cent copper, 0.44 per cent lead, and 0.91 oz. of silver per ton. About 16 per cent of the lead in the heads is oxidized, and likewise, about 25 per cent of the cop-

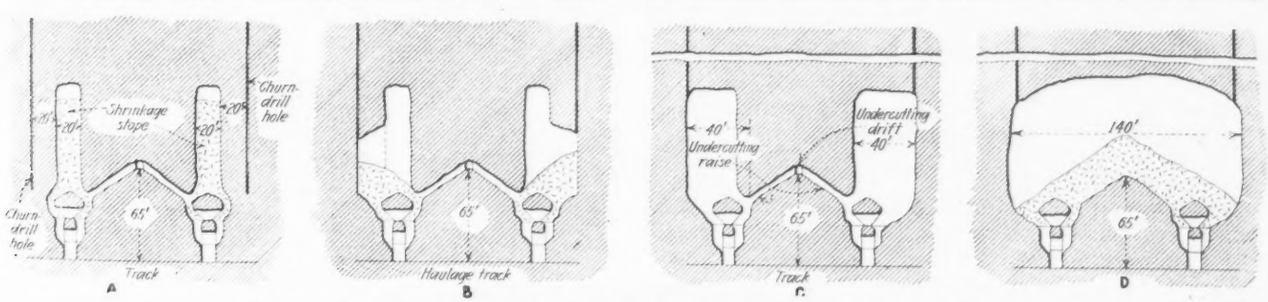


Fig. 5—Vertical cross-sections of mining unit shown in plan in Fig. 4 Stages in progress of mining shown by A, B, C, and D

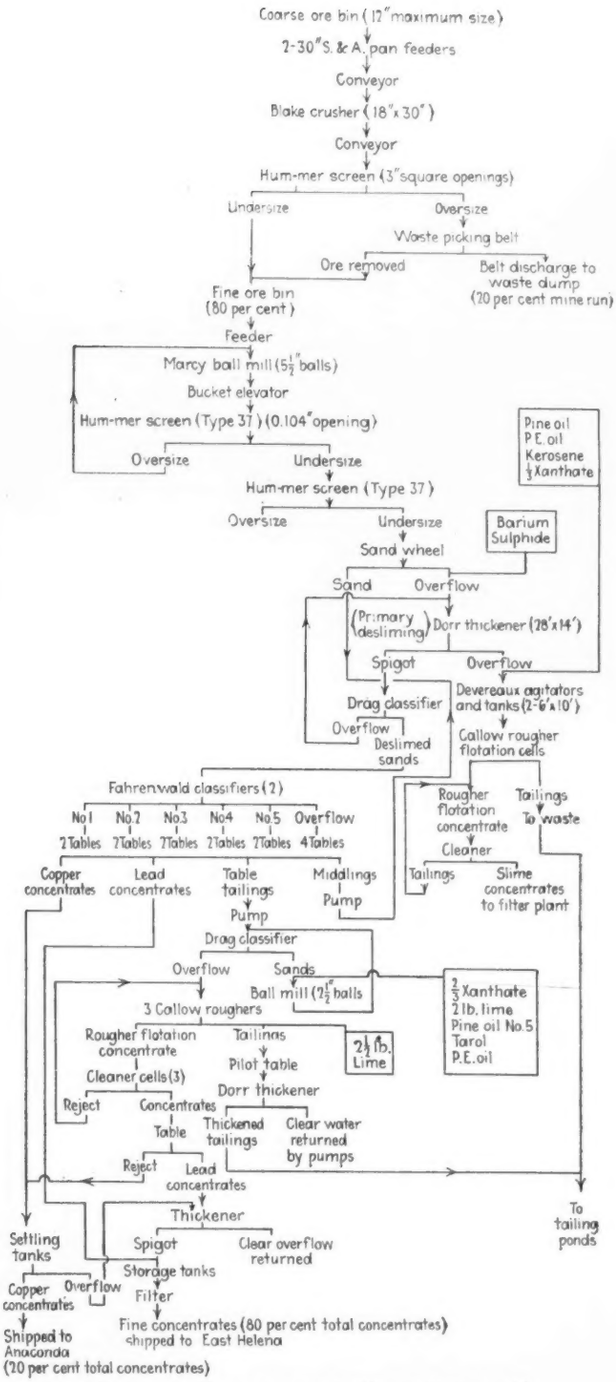


Fig. 6—Flow sheet of Silver Dyke mill

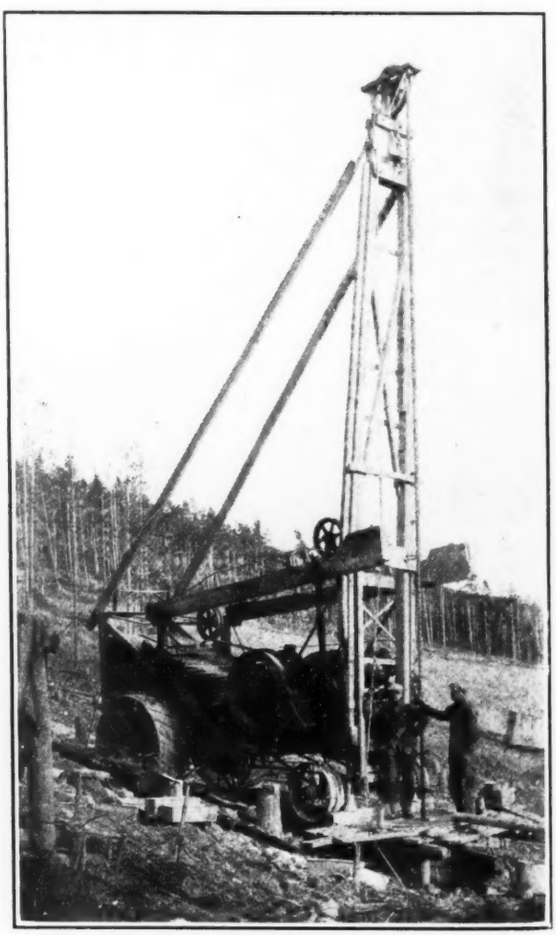
per. In the tailings about 46 per cent of the copper is in oxidized form and 23 per cent of the lead. The recovery, considering the physical nature of the ore as well as its chemical composition, is excellent—72.94 per cent of the copper, 73.09 per cent of the lead, and 80.55 per cent of the silver. The ratio of concentration is 13.15 tons of ore to 1 ton of concentrates.

Sorting Precedes Fine Crushing

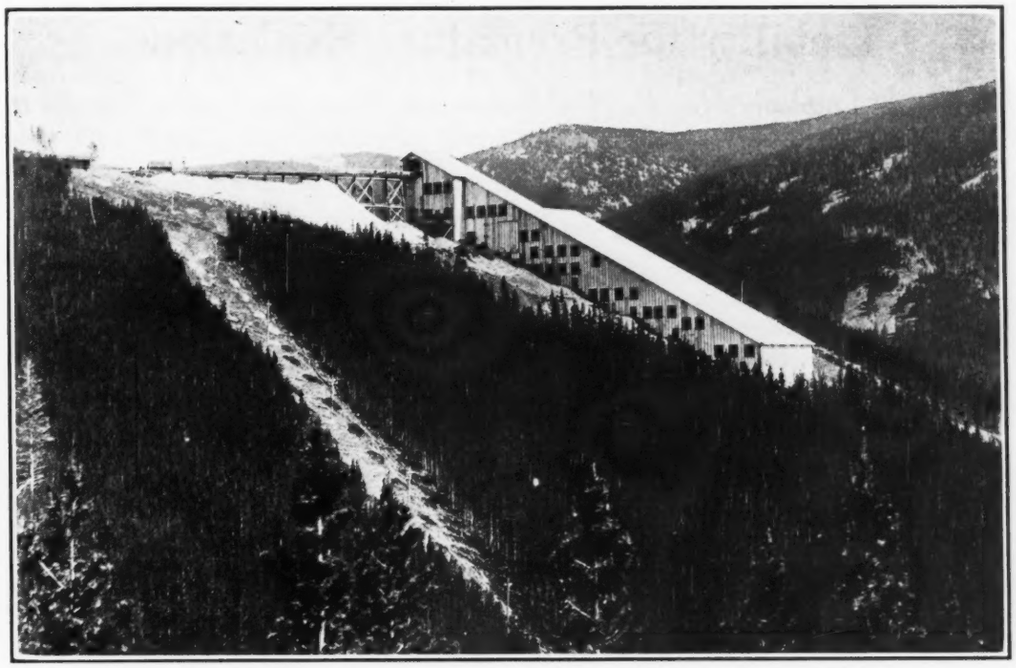
A preliminary separation is made after coarse crushing, the crusher product passing over a vibrating screen, 3 by 3-in. openings, the oversize being received upon a picking belt. At this point about 20 per cent of the ore stream is rejected as waste. It is planned to extend picking facilities and reject from 30 to 35 per cent of the mine run after screening. An automatic aërial tramway supported upon towers is to be installed for the efficient handling of the waste rock.

After fine grinding in a ball mill in closed circuit with a Hum-mer screen (0.104-in. openings), the pulp undersize is diluted and the slimed portion removed from the sands by means of a Dorr thickener tank, barium sulphide being added as a deflocculating reagent. This desliming is an essential feature of the successful treatment of the ore. By means of it the principal colloidal material is removed from the mill circuit and further interference avoided. The suspended slime or overflow from the deslimer is sent to two 6x10-ft. tanks equipped with Deveraux agitators and is mixed with flotation reagents—pine oil, P. & E. oil, kerosene, and xanthate—and sent to a Callow rougher cell, the tailings going to waste and the rougher float passing to a cleaner cell, the reject of which goes to the rougher and the cleaned flotation concentrate to the filtration plant. The spigot product of the desliming tank is sent to a drag classifier, the overflow of which is returned to the deslimer and the sand product delivered to two Fahrenwald hindered settling classifiers the spigot products of which are treated on tables.

A lead and also a copper concentrate are made, and the middlings are pumped back to the drag classifier. All table tailings are sent to a drag classifier in closed circuit with a ball mill. The overflow is treated in three Callow roughers, the rougher float being sent to Callow cleaners and the tailings to a pilot table and thence to a thickener. the clear water being returned



Churn drilling at Silver Dyke



The Silver Dyke flotation mill. Gravity flow and plenty of lumber are assured

and the spigot product going to waste. The reject of the cleaners is returned to the roughers and the cleaned concentrates are laundered to the filter plant. The flow sheet is shown in detail in Fig. 6.

Two products are made, a lead concentrate and a copper concentrate, the former being shipped to the East Helena smelter and the latter to Anaconda. The quantities of reagents used are as follows: Barium sulphide, 3.26 lb.; xanthate, 0.31 lb.; lime, 5.47 lb.; No. 5 pine oil, 0.08 lb.; Tarol, 0.07 lb., and P. & E. oil, 0.06 lb. per ton. Grinding is to 10 per cent on 60-mesh screen. Chrome-steel balls are used in the primary grinder and hard iron balls in the secondary. Ball consumption is 2.03 lb. per ton. Mill power consumption is about 18 kw.-hr. per ton.

Bottom-dumping coal cars adapted to ore haulage on covered track from mine to mill, at the Silver Dyke

The dewatering and filtering plant is equipped with two slimed-concentrates storage tanks, each provided with a Goldfield type of agitator and both discharging to a bucket elevator in closed circuit with an American filter. Granular concentrates are laundered to two small tanks 6 ft. in diameter and 6 ft. deep, the bottoms being filter beds. An 18-in. vertical pipe is set in the tank before filling, and when the tank is filled this is removed and the concentrates are discharged into a bin at about 8 per cent moisture.

Concentrates are hauled in 5-ton solid-tire, White trucks to the railroad loading station 3½ miles away at a cost of $1.50 per ton; up freight is handled at $2 per ton. Light trucks, teams, and sleds have been tried, but the heavy truck appears to have given the best service.

Two water circuits are maintained in the mill, one for reused water and the other for clear water, the first being used for dilution in the primary grinding circuit and the second on tables and for additional dilution in "granular" flotation circuit and where necessary. Water is pumped from Carpenter Creek to the lower end of the mill at a head of about 400 ft. Return and clear water are pumped to tanks on the hillside about 200 ft. above the lower floor of the mill.

Tailings disposal presents certain difficulties, as the colloidal content of the ore causes it to settle very slowly. The small area available for settling ponds introduces a severely limiting condition. Hydraulic fill and crib dams have been constructed, and the available area for ponds has been utilized to the best advantage.

West Rand Plant Nearing Completion

Five drum filters, 14x16 ft. in size, will be included in the new plant of the West Rand Consolidated Mines, in the Transvaal, South Africa. These will be the largest filters in Africa. When completed this plant will have a capacity of 80,000 tons per month, according to *The Mining and Industrial Magazine*, of Johannesburg. Excavations for the new crusher station are well advanced, and the crushing plant has been ordered from Europe. Orders have also been placed for the tube-mill plant, consisting of eight tube mills with motors; for three electric locomotives and twenty hopper cars required under the new plan for surface transport; and for two air compressors, with a total capacity of 15,000 cu.ft. of free air per minute. Details of the metallurgical method should be available soon.

Liability for Premature Explosions

Either Workman or Employer May Be Held Responsible When Carelessness Results in Injury—Inexperienced Miners Should Be Instructed—Proper Tools Must Be Provided

By Leo T. Parker
Attorney at Law, Cincinnati

THE LAW relating to the liability of mine owners for injuries sustained by employees as a result of premature explosions is well established. Fundamentally, an employee assumes the ordinary risk of the work which he agrees to perform. Therefore, where a workman is injured, not as a result of negligence on the part of an employer, the employee usually cannot recover damages.

For example, in a recent case the court held the owner of a mine not liable for injuries sustained by an employee where the injury resulted from a premature explosion caused by a workman attempting to force a cap into a hole that was not large enough to admit it. In this case the court said that the explosion may have been caused by the necessary pressure required to force the explosive cap into the small hole, although evidence was not introduced to show why the explosion occurred. However, the drillman was severely injured and sued the mine owner for damages, on the ground that the employer was negligent in supplying him with a stick of explosives of which the wrapping paper was torn at the cap hole. The drill man used a pocket knife to make a new cap hole, and stated that he had used a cap in that manner several times before in his many years of mining experience, and thought that he could do it safely again. The drill man also testified that he was not aware that the powder contained such a high percentage of nitroglycerin, but the mine proprietor proved that its strength was printed on the container. Afterward, the injured man testified that he had not examined the label.

The reason the court held the owner not liable for the injuries is because the law is well established that a miner should exercise ordinary care in protecting himself against injury. Moreover, where he is supplied with explosive material that is not in the proper condition, it is his duty to notify his employer, or the foreman, so that the defects may be remedied. If the employee fails to do this, he assumes the risk.

Where a workman is not negligent, a mine owner is liable for damages if he supplies unsafe powder which explodes prematurely and effects injury. Also, if the foreman changes to a more dangerous explosive without informing the drill man of the substitution, or does not give complete information to the workman relative to the degree of caution required, the employer is liable for injury or death caused by the new powder. For instance, where it was disclosed that a workman had used 25 per cent strength powder, except on two or three occasions, and that on the occasion of the injury the miner was not informed that the powder supplied him was of higher percentage, the court said that, in view of the testimony, the workman had exercised ordinary care and did not use unnecessary force in placing the shot, which exploded prematurely. Therefore, the employer was liable. In another case, a similar verdict was rendered in favor of a workman who was injured as a result of a mine owner having furnished a quicker fuse without taking the precaution to notify the workmen of the change.

When a mine owner fails to exercise ordinary care and judgment in informing inexperienced employees of the danger of a premature explosion, the courts also generally hold that the workman is entitled to recover for the injury received. For illustration, in a case where it was shown to the satisfaction of the court that a mining foreman told an inexperienced man to drill and plant a shot without giving the man proper instruction, as a result of which the workman was injured, the court held the mine owner liable for the damages which resulted when the employee attempted to fire the blast by use of a fuse entirely too short for the purpose.

Another act for which the mine owner may be held responsible is the supplying of defective tools as a result of which a workman is injured; usually for the reason that the law expects the employers to exercise care to furnish safe and proper tools and appliances with which to work. On the other hand, where an employee is sufficiently familiar with the occupation of mining so as to be capable of using a tool intelligently, even though it is well known to be dangerous, the workman is not entitled to recover for injuries sustained in the ordinary performance of the work. For instance, where it was disclosed that a miner requested the permission of a foreman to use a steel drill for loading a hole, when pieces of gas pipe plugged with wood were generally used for the purpose, the court in effect said that the use of a steel drill by the injured man was an act of gross negligence on his part, and that the risk which the workman assumed, under the circumstances, was so well known that he could not expect to recover compensation from an employer for the injuries sustained, simply because he, an experienced miner, proceeded without exercising ordinary care and prudence in protecting himself against a known danger. Where an employee is careless, he cannot recover for injury received but simply because a workman is known to be careless and reckless is not sufficient to establish the fact that he was careless at the time the accident occurred.

Where both the employee and employer are negligent, as a result of which an accident happens, the person whose negligence is the direct cause of the injury may be responsible for the damages inflicted. For example, although the employer may be negligent in supplying material that is defective, or does not notify the workman of unknown dangers, or does not instruct a new employee as to the dangers connected with the work, if the negligence of the workman is the proximate cause of the injury, the employer is not liable for damages. In a recent case where a similar point was involved it was disclosed that the injured workman was slightly negligent, but that the negligence of the employer was of considerably greater degree. Under these circumstances the employer was held responsible for the resultant damages.

Making Iron From Beach Sands in Japan

Titaniferous Magnetite to Be Treated by Tokiwa Company, Using Thornhill Process

By James W. Neill
Chief Engineer, Tokiwa Company, Ltd., Kuji, Japan

IN THE FOOTHILLS near Kuji, Japan, occur deposits of iron sand that have been known for centuries. Records of work done on them date back to 1650 A.D. From these deposits was obtained the iron for making steel for the celebrated Samurai swords, which, it is claimed, would cut through any other swords.

Kuji is a small town in Iwate Prefecture on the east coast of the island of Hondo about 100 miles south of its northern tip. It is 12 miles to the nearest railroad station, on a branch line which connects with the main line about 40 miles away. To the latter junction point traffic is usually routed. Roads are rough and hilly, and in the spring impassable.

Kuji Bay is two miles wide by two long, protected by sharp points of rocks from northeast and southeast storms but open to the Pacific otherwise. It is deep enough for 6,000-ton steamers, but they must anchor at some distance from the shore and cargoes must be transferred to lighters and landed through the surf.

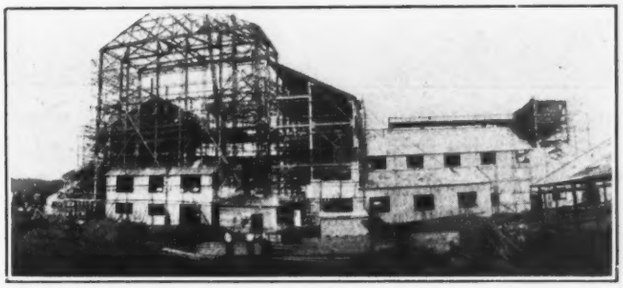
The deposits lie in the foothills about five miles back of the town, at an elevation of about 800 ft., and extend for about 15 miles along the foot of the higher hills. They constitute an ancient ocean beach, which has been elevated to its present location. The iron was originally deposited as a magnetite sand brought down by streams to the ocean from some erosion area in the mountains and distributed by wave and current along the ancient littoral. The Tokiwa Company, Ltd., of which Goro Matsukata is president, has prospected the deposit for some 15 miles in length. The greatest width thus far determined is 4,000 ft. and the average depth of minable ore about 10 ft., though in places the sands carry good values to depths of 75 ft.

These iron sands are deposited in layers of varying iron content, the best grade usually being at the top. They lie either upon the bedrock or upon other layers of sand and gravel of little or no value. They carry persistently a small amount of gold. The ore consists of magnetite grains, with much limonite derived partly from the breaking down of the magnetite, together with barren sand, pebbles, and in places boulders of fair size, all well rounded. The grains are very fine, practically all passing 65 mesh.

The limonite in the ore is also derived in part from the oxidation of the hypersthene, which is quite abundant in the original ore. The magnetite carries about 14 per cent TiO_2, and the crystals of ilmenite (rutile?) are so minutely interlaced in the magnetite grains that crushing to 100 mesh fails to effect a separation. The limonite carries from 2 to 5 per cent TiO_2 only. In the ground thus far developed the ore carries about 35 per cent magnetite, and this contains 40 per cent of the total iron; the balance is in the limonite.

The overburden is a sandy yellow clay, and is from 10 to 50 or more feet deep. The formation is only slightly inclined toward the ocean. Occasionally steeper dips occur where the bedrock is steep. Bedding of the layers is irregular, and shows indications of wave action.

Coal seams occur in the vicinity, usually below the heavy beds of cemented gravel; they carry beds of fair lignites from 2 to 4 ft. thick, which have been extensively mined in the past and are now being developed vigorously, in the hope that they will ultimately supply the demand of the Tokiwa Company's reduction plant, amounting to 350 tons per day.



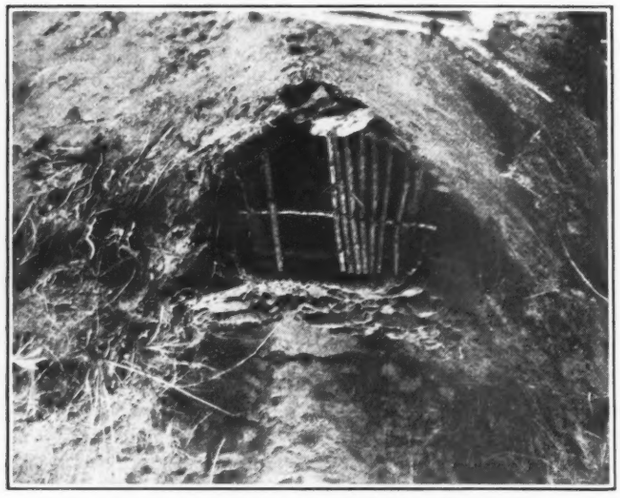
The Tokiwa Company's sponge iron plant, in course of erection, near Kuji, Japan

Elevation of the formation must have been rapid. It is cut by several deep gorges of the Osanai and the Kuji rivers. These canyons are evidently the result of fracturing during elevation. The original beach plain has been subsequently widely eroded, many small and large gulches cutting through it, the ore deposits being left on the ridges only or on the benches connecting these ridges. The ore is deepest against the ancient shore line, and thins out toward the sea. Tonnage in the area prospected is large.

Owing to its being nearly horizontal and the overburden slight, the deposit might be mined by steam-shovel stripping and open-cut mining. Because of the high installation costs, however, and the smallness of some of the areas, and, above all, the necessity for selective mining, the Tokiwa company has decided to adopt underground mining. The system used will be retreating cover caving, for which the preliminary development has been laid out. The ore drills easily and most of it can be "augered." As the roof stands well, it is hoped to be able to recover much of the timber used. The first unit developed—namely, the Motoyama mine—is now ready for production whenever called upon.

Transportation Difficulties

No practical way appears for getting a rail connection between mine and beach direct. A wire-rope tramway also offers many difficulties and would be expensive. The older development at the Motoyama mine had included a narrow-gage railway from below the mine in the Osanai gorge to near Kuji, connection between the mine and rail being made by a wooden chute. It was decided to use this method. The railway has been rebuilt to better grade and curvature and equipped with



Old tunnel at Miznunashi. Above this is 40 ft. of ore

heavier rails and with gasoline locomotives. The connection will now be made by two short rail lines on the hill, and two chutes, one 130 ft. and one 825 ft. long at inclinations of 41 and 42 deg. from the horizontal.

These chutes are 3 by 2 ft. and lined with steel plate. It is expected that they will play an important part in the breaking up of the lumps of ore and freeing the cobbles and pebbles from the iron sands. At the foot of the long chute, a "breaker" bin of concrete has been built, from which the ore is carried by pan feeder and belt conveyor to a 4x25-ft. revolving screen (with half-inch round holes) placed over a receiving bin of 250 tons' capacity. Here it is hoped to eliminate the pebbles, and save the crushing and haulage costs.

The Gorge line will take the ore to a storage bin at the mouth of the gorge, in small trains; thence it will go in 20-carload trains to the new plant at the beach, a distance of 5 miles. The haul is thus split up to help eliminate a steep grade at the entrance to the gorge, and at the same time provide storage against the contingency of rock slides in the narrow and rocky gorge.

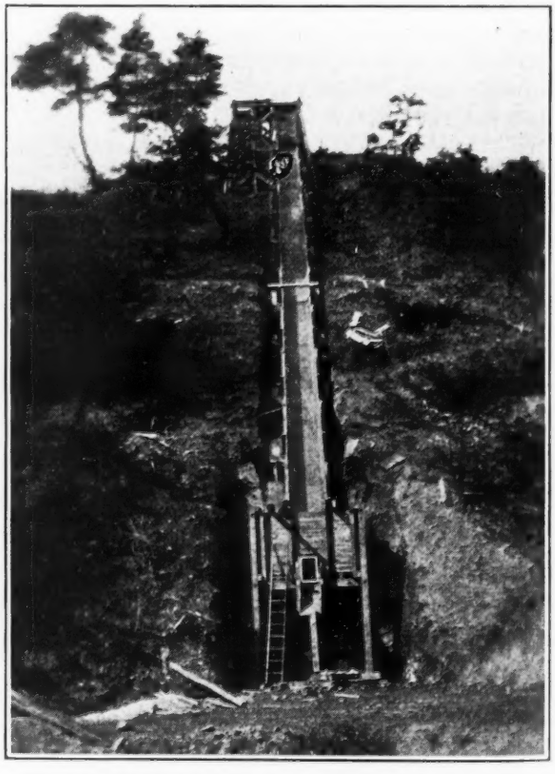
To better the transport between ship and shore and vice versa, a new channel for the river has been dredged through the sand bar at the beach, but the volume of water in the river is insufficient to maintain this channel against the ocean storms, so that the operating company is now building a breakwater across the mouth to protect it from the waves, and hopes to be able in this way to maintain the channel. A canal has been dredged from this channel to the new plant, so that when all is finished barges can load and unload at the plant and proceed to the vessels in the harbor, effecting a great saving in time and insuring the necessary tonnage. In even fairly rough seas it is now impossible to land through the surf, and in the winter months it would not be possible at all.

If the iron contents of the ore had all been present as magnetite, the metallurgy would have been simple enough, as either wet gravity or wet magnetic separation methods would have been successful. The presence of a major percentage of the iron in the form of limonite, and the fact that this slimes completely in wet crushing, made it necessary to find some better method.

The fact that the limonite slimes so readily suggested the use of this method of separation, and a test was made by wet-crushing and tabling to produce a magnetite concentrate, followed by a desliming of the table tails, to produce a limonite slime. As a result of this test a combined concentrate was obtained carrying 35 to 45 per cent iron, and from 65 to 75 per cent of the total iron of the ore. This loss was too great to warrant the use of the method practicable on the higher-grade ores, but the method will eventually be used on the lower grades to bring them up to furnace grade.

Wet magnetic separation followed by similar sliming was not as successful, and dry magnetic separation even less so. Tests were made to "magnetize" the limonite by heat and using carbon reduction. These gave promise of being successful, but the direct or sponge-iron process seemed the rational method, instead of the half-way step of magnetizing. Tests made in the United States on the crude ore and on the concentrates by the sponge-iron process gave surprisingly high results, recoveries up to 97.5 per cent being obtained. From the sponge several heats of excellent steel were made in the electric furnace. It was decided to adopt this process, and the Japanese patents of Mr. Thornhill covering his furnace and method were purchased.

A plant containing two furnaces, each of a stated capacity of 35 tons of iron per day, is now being erected near the beach, together with a power plant of 1,000 kw. Under the process to be used the ore is preheated in a MacDougall furnace to 900 deg. C. and then dropped on to the hearth of a reduction furnace, where it is mixed by stirring arms with sufficient carbonaceous matter to effect reduction. The necessary additional heat is supplied by burning producer gases in carborundum tubes carried on carborundum arches over the revolving hearth of the furnace. The reduced ore is dropped into revolving cooling cylinders, and thence conveyed to magnetic separators, which will produce a sponge iron carrying from 60 to 72 per cent iron, together with about 14 per cent TiO_2, 6 to 8 per cent SiO_2,



Upper chute for transporting ore

and varying quantities of magnesia, lime, and manganese. Sulphur and phosphorus are very low in the ore, though some of each will be added by the ash of the reducing coals. This sponge concentrate will be compressed under 30,000 lb. pressure to form briquets, without any binder, and these will be shipped to open-hearth furnaces for making steel. It is intended ultimately to melt these briquets on the spot in electric furnaces, but the necessary electric power is not now available.

The reduction plant complete will cost about $1,000,000 and the entire investment will be nearly $1,500,000. The company also owns a complete blast furnace and a coking plant, which are situated near this new plant. Two years ago the furnace was run for several months on the local ores, to demonstrate the feasibility of removing the TiO_2 by the blast furnace, and was entirely successful in so doing. It is possible that this plant may be used to melt the sponge briquets, and ship out pig iron, instead of the lower-grade material, thus saving freight and treatment charges and avoiding the national superstition against the presence of TiO_2.

Resistance to Wear a Basis for Concentrating Ores

Relative Hardness and Brittleness of Certain Non-Metallic Minerals May Be Utilized in Their Separation

By A. M. Gaudin
Associate Professor of Metallurgical Research, University of Utah

ORE CONCENTRATION is the result of a differentiation between minerals on the basis of one of their physical properties, such as specific gravity in gravity concentration, magnetic susceptibility in magnetic concentration, conductivity in electrostatic separation, molecular forces such as adsorption in flotation, and dielectric properties in electroendosmotic concentration. Certain physical properties of minerals have, however, been neglected in spite of their being well known. Among these, resistance to wear, hardness, and brittleness stand foremost. Though minerals frequently differ greatly in resistance to wear, little attempt has been made to apply this distinction commercially.

Hardness, brittleness, resistance to wear, and friability are frequently confused in the minds of people because several of these properties frequently occur together, and because of loose usage. "Friability" is essentially associated with structural weaknesses in an aggregated material; for instance, one might speak of a friable soil, a friable sandstone, or a friable coke, but not of quartz, sphalerite, or calcite as friable. It is primarily dependent, not on the properties of the minerals themselves but upon that of the rock or ore which they constitute. Resistance to wear depends upon both hardness and malleability. Most minerals generally have a very low malleability. Hardness may therefore be considered as substantially equivalent to resistance to wear, although there are remarkable exceptions, such as native copper and horn-silver. It is thus clear that resistance to wear and non-friability are entirely different. Hardness and brittleness frequently occur together, but it does not follow that a hard substance is brittle; in fact, the association of hardness with toughness, which is more or less the opposite of brittleness, is one of the most desirable qualities in many metals and alloys.

Characteristics of Natural Reduction

Differences in resistance to wear in minerals can be used as the basis of a separation between different minerals, by a suitable crushing operation followed by a suitable sizing action. I have established the fact that crushing, in general, proceeds by fracture across the grains subjected to it. In nature, on the other hand, mechanical disintegration of minerals is largely the resultant of wear, for the reason that the crushing and the crushed mediums are of substantially the same order of magnitude and no sharp line can be drawn between these mediums. The wearing action of gravel on a beach, and of boulders in a stream bed are instances of this type of disintegration.

In industrial crushing, since it is desired to pulverize the material in the smallest possible time, the practice has been to use crushing mediums that are very powerful compared with the substances crushed. In ball-milling, for instance, steel balls 5 in. in diameter are used to crush quarter- to half-inch ore. In investigating the performance of ball mills, in particular with reference to quartz as the material to be crushed, it was found that when the size of the balls is large enough so that the pieces of quartz can be nipped by the balls, crushing is obtained by fracture just as it is obtained by fracture with jaw crushers, gyratory crushers, rolls, rod mills, and disk crushers. When the size of the balls is too small for the particles to be nipped by the balls, however, the only action that the latter can have is to wear off the corners of the particles. The resulting worn particles present a strikingly rounded appearance in contrast with the sharp features obtained by fracture across the grain. The reason why disintegration by wear is the rule in nature is because the various agencies at hand exert a marked sizing action on the material being worn, so that particles of very different sizes are not so likely to be present together. This prevents nipping of small grains by large ones, and therefore makes wear the only disintegrating agency possible under ordinary conditions as found in natural deposits.

Whereas fracture of grains depends principally on the brittleness of the grains, wear is essentially dependent on hardness, provided the malleability is low. As a result, if crushing is conducted by fracture on a group of grains some of which are brittle and some of which are tough, the brittle grains will be disintegrated further than the tough grains; if the same operation is conducted by wear on the same grains, now regarded as hard and soft respectively, the soft grains will be

worn down while the hard grains remain comparatively intact. The two methods of disintegrating are thus seen to yield diametrically opposite results, since brittleness and hardness are usually simultaneously present. One type of crushing will make the hard, brittle grains coarse, and the other type of crushing will make them fine. Even if brittleness and hardness are not associated, and brittleness is entirely eliminated from this study, differences in resistance to wear make it possible to crush[1] an ore by wear in such a way that the hard grains are left comparatively coarse and the soft grains comparatively fine.

The combination of such a differential crushing operation with a sizing action, whether it be classifying or screening, or with some other process, will therefore have separated the hard mineral from the soft mineral.

This theory was tried out in connection with the problem of concentrating low-specific-gravity diamonds, or carbonados. The following experiments were performed with one one-quarter-inch low-specific-gravity diamond:

Experiment No. 1—The diamond and 2,500 grams of native gravel were placed in a batch ball mill filled with 10 lb. of 1-in. balls, and ground dry for four hours, at the end of which time about 500 grams of gravel and the diamond remained unground.

Experiment No. 2—The carbon and 2,500 grams of minus 6.6 plus 4.7 mm. crushed quartz were placed in the batch mill filled with 20 lb. of 1-in. balls, and ground dry for eight hours, at the end of which time the diamond and 1.2 grams of quartz remained unground, the rest of the quartz being reduced to impalpably fine dust.

Experiment No. 3—A duplicate of No. 2 except that grinding was done wet (35 per cent moisture instead of dry). As a result, 40 grams of quartz and the diamond remained unground. The rest of the quartz was reduced to fine slime.

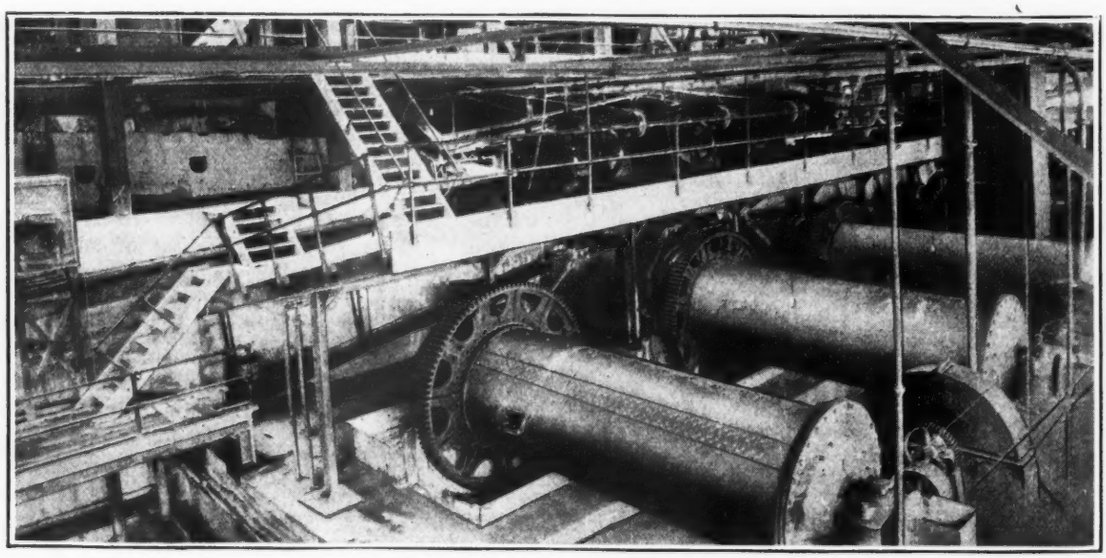
It is to be noted that the same diamond served in all three tests. This diamond was obtained by fracturing a larger carbonado in a mortar with a slight tap of a pestle. This illustrates incidentally the ease with which a substance as hard as diamond can be broken by fracture.

These tests are conclusive so far as diamond is concerned, the ratio of concentration obtained being as high as 2,000 to 1. It may be objected that the difference in hardness among other minerals may not be so great as that between quartz and diamond, and that therefore such satisfactory results as the above could not be obtained in other instances. It is, however, to be noted that such great ratios of concentration as were obtained here are not needed in other fields of industry.

The process above outlined, which depends entirely on the differential resistance to wear of the associated minerals, should not be confused with another process of concentrating by crushing, which depends on the difference in grain size of different minerals constituting the rock to be crushed, or on a process depending on differences in friability between different parts of the rock. I established the fact that structurally heterogeneous rocks—that is, rocks in which there are lines or zones of weakness around the grains—break preferentially by fracture along these weakness lines. As a result, in such heterogeneous rocks containing two elements, one of which is coarsely crystalline and the other is finely crystalline, a simple crushing operation followed by a sizing operation, such as screening, will separate one of the minerals from the other to a greater or lesser extent. This process, which has been used occasionally in ore dressing, is independent of the intrinsic physical properties of the minerals contained in the rocks under treatment, and depends solely on the state of aggregation of the minerals, or friability of the rock.

It is difficult to foretell the applicability of a process of concentrating ores by difference in resistance to wear of their constituent minerals, because not sufficient work on this basis has yet been done. It is believed, however, that this process can be applied with economic advantage in concentrating placer minerals, such as diamond and corundum, and in concentrating certain valuable non-metallic minerals, such as feldspar.

[1]The type of crushing in which the ore particle is abraded rather than fractured would preferably be termed "grinding," but the author's term will be retained in this article.—THE EDITOR.



The grinding floor of the San Francisco mill, at the Santa Gertrudis mine, Pachuca, Mexico

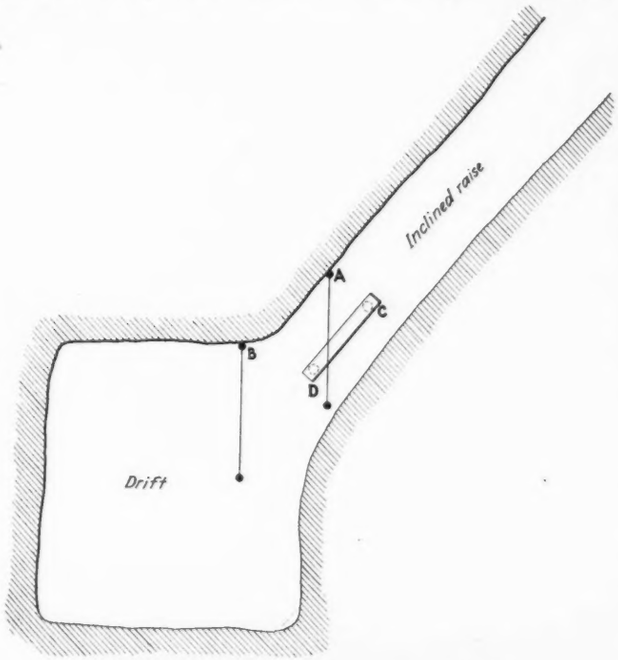
Useful Operating Ideas

Aligning Raises for Connections

By G. H. Parker
Brule Mining Co., Stambaugh, Michigan

The method of aligning raises to be described applies equally well to raises with inclinations ranging from 0 (horizontal drift) to 90 deg. It requires a small amount of engineering work. When the lines are once in place they are usually permanent and may be used by the workmen as well as the engineer.

A transit and a protractor level are required to fix the controlling lines. The Brunton compass serves the latter purpose, and, in short raises, may be used with reasonable accuracy in place of the former for fixing bearing lines (provided the mine is free from local magnetic disturbances). For fixing bearing lines, a spad is placed at *B* (see accompanying figure), either in a wooden plug or in drift timber. Another spad is then lined in at *A* by the transit, with the transit set up under *B*. This spad is driven either in a wooden plug or in raise timber.



Details of raise alignment method

For directing inclination, two holes a foot or so in depth are drilled at *C* and *D* approximately on the line of the desired inclination of the raise. Wooden plugs are then driven in tightly, flush with the side of the raise. Then a hardwood board three or four feet long is spiked to the plugs, the upper edge of the board being midway between the hanging and foot of the raise and at an inclination coinciding with that at which it is desired to drive the raise. By sighting along the upper side of this board, the raise may be easily directed for inclination. In a timbered raise the board is spiked to the cribbing, no plugs being needed.

One advantage of this method is its simplicity. Again, it is permanent and always ready for instant use. The miner can check his work before starting the drilling of each cut. Blasting seldom destroys the alignment of the board unless it is placed in very close proximity to the blasting point. The bearing lines (cords) are hung aside on a hook while not in use. In a timbered raise the "inclination" board may be kept within a short distance of the working face.

This method of aligning raises has been used with decided success for "holing through" raises up to 160 ft. in length, and its accuracy, if checked occasionally, should insure success in much longer work.

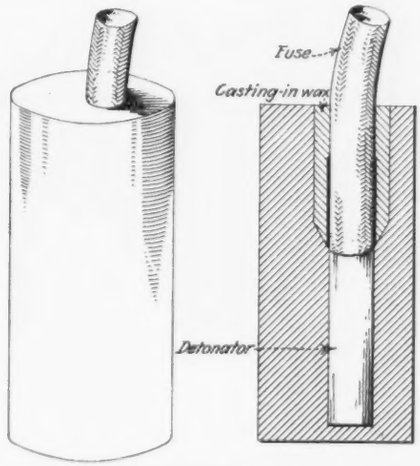
Wooden and Wax Primers

Replacement to a considerable extent of ordinary methods of preparing primers by wooden primers is a feature of South African mining practice, according to the *South African Mining and Engineering Journal.*

The wooden primer is a short cylinder of wood in which a hole, slightly greater than the length of the blasting cap, is drilled diagonally from the side, and of sufficient diameter to accommodate the cap and attached fuse. The end of the cap is in the axis of the short cylinder, both cap and fuse being retained by a coating of wax placed at the junction of fuse and blasting cap. The end of the short wooden cylinder affords a surface for the application of the tamping stick. The wooden cylinders are made in quantity.

An improvement, or what is claimed to be an improvement upon the foregoing, is the Griesel waterproof wax primer. This consists of a precast cylinder of wax, having an offset hole of two slightly different diameters. The bottom of the hole affords a close fit for the blasting cap, which extends to within a sixteenth of an inch of the bottom of the wax cylinder. The cap, with attached fuse, is inserted and molten wax run into the annular space, thus sealing it in place. (See illustration.) Cutting and capping fuse and insertion in the wax cylinder are done at the factory.

It is stated that the wax primer is being used to a



A new primer used in South Africa

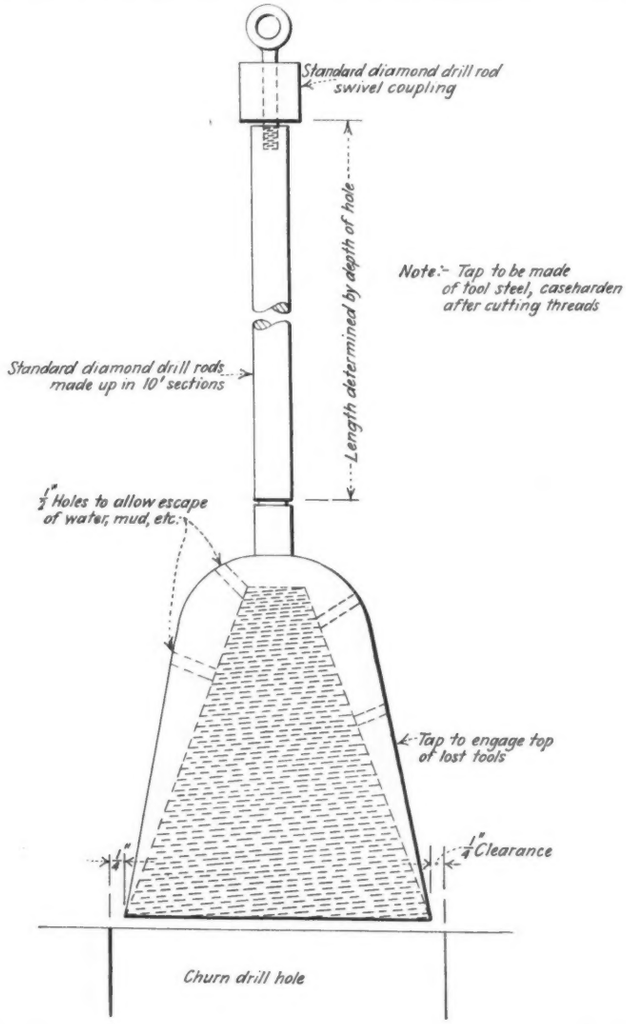
fairly wide extent. The inventor recommends placing the wax primer on top of the first stick of explosive with the remainder of the charge above it. As between the two forms of primers experience is necessary to bring out any advantages of the one as compared to the other.

Special Tool for Recovering Churn-Drill Tools

By Roy H. Poston
St. Francois, Missouri

Churn-drill tools often become loosened at the joints or are broken off at some point and fall back into the hole while the drill is in operation. The subsequent task of recovering the lost section is not always easy. Such a condition was recently obtained at a southeast Missouri mine when the entire string of tools, weighing 1,468 lb., together with 60 ft. of 2¼-in. manila rope, broke off the main cable while drilling and fell to the bottom of a 225-ft. hole. The force of the fall caused the top of the tools to become embedded in the side of the wall, and this position further complicated their recovery.

Some ten days were consumed in cutting and removing the rope and in trying to get over the end of the tools with standard churn-drill fishing tools. A tap, constructed as shown in the accompanying sketch and used in conjunction with standard diamond-drill rods


Standard diamond drill rod swivel coupling
Length determined by depth of hole
Note:- Tap to be made of tool steel, caseharden after cutting threads
Standard diamond drill rods made up in 10' sections
½" Holes to allow escape of water, mud, etc.
Tap to engage top of lost tools
¼" Clearance
¼"
Churn drill hole

Special tap used in the recovery of churn-drill tools

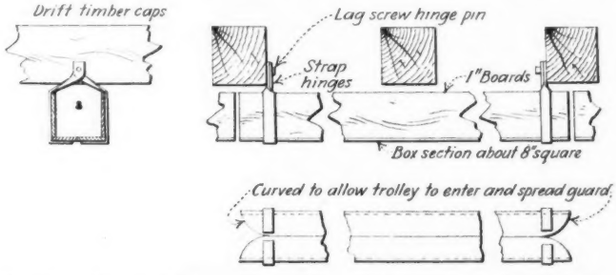
finally accomplished the desired result, and the lost tools were retrieved in an hour and forty minutes after the special tap was lowered into the hole.

In operation the tap was fastened to the diamond-drill rods and lowered into the hole by the addition of other rods until the tap rested on the upper end of the churn-drill tools. Hand pipe wrenches were then employed to turn the rods, until the tap threads began to engage the top of the rope socket. Additional leverage, by means of pipes over the end of the wrench handles, forced the tap to take firm hold of the rope socket. When this had been accomplished it was only necessary to connect the diamond-drill rod swivel to the sand line and pull the tools loose and out of the hole.

Trolley Wire Guard

By E. H. Oneal
Mechanical Engineer, Old Dominion Mine, Globe, Ariz.

A new type of trolley wire guard is being successfully tried out at the Old Dominion Mine, Globe, Ariz. It is of the box type, closing in the trolley wire at the sides and bottom, as shown in the accompanying drawing. The box is constructed of 1-in. boards, which are fastened to hangers or hinges as shown. The length of each section and the clearance dimensions depend upon

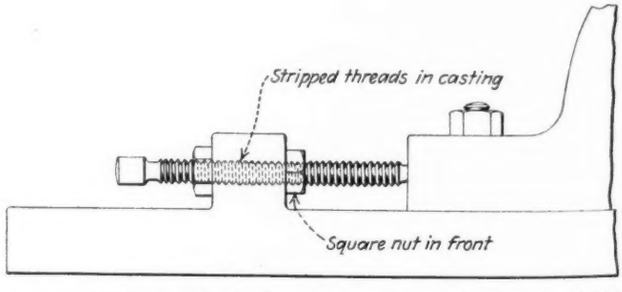

Drift timber caps
Lag screw hinge pin
Strap hinges
1" Boards
Box section about 8" square
Curved to allow trolley to enter and spread guard

the location, whether on curves or tangents, and whether the trolley wire is directly over the track or at one side. Each section is so cut at either end as to allow the trolley to enter and leave the guard, pushing the two portions of the box outwards. The guard was designed and built by W. J. McCune, framing shed foreman for the Old Dominion company.

Repair to Adjusting Setscrew

By Charles Labbe
Clarkdale, Arizona

On a large bearing sole plate the threads in the casting became stripped and the setscrew would not hold. To restore the usefulness of the setscrew, a drill was run through the hole to make it smooth. Using the



same setscrew and placing a square nut in front of the casting, the repair was made without any loss of running time. The accompanying sketch shows the arrangement.

Discussion

A Mexican Incident

THE EDITOR:

Sir—The following letter which I have received from Mexico is of general interest: ENGINEER.

San Francisco, Calif.

"This last affair is just about the most ridiculous thing that has come to us since I have been here, leaving out, of course, the loss of money: Lorreto Martinez was a watchman around the mill for a couple of years or so up to about two years ago. He took a shot at an old man and left his work and has lived in the hills ever since. Just before we left last June he came into town and shot the old man and a son. This was a family feud of many years. He was chased into the hills and hunted for quite a while. He swore that he would be back and get the rest of the family and the judge. He has been in town several times, according to reports, but never has attempted anything other than his vengeance against this one family.

"Early yesterday morning, he, with from fifteen to twenty men, appeared in the streets of the town and caught the night sergeant of police and disarmed him. Then he called each of the other police to him by the sergeant's whistle, and as each came disarmed him. They broke into the City Hall, and as the day force of police appeared to go on duty they grabbed them in turn and finally had every policeman in town locked up in the jail. Word was sent to the Presidente Municipal that there were bad men in town, so he hurriedly dressed and hid. His wife tried to send a telegram to Mazatlan to notify the military authorities, but the operator would not send the message on his own responsibility and wanted the presidente's signature. He said that he personally did not know that the town was held up by a gang of men.

"Part of the gang was at the public market and took the arms from all who appeared and held the men and women there in the market. The leader sent word to all the merchants that they could open the stores without fear, as he was not there to rob them. They hunted around for the judge and public prosecutor, the presidente, and chief of police and members of the family that he was after. He did not find any of them, as they were well hidden.

"About 6:30 the head watchman at the mill came to tell me about the affair. All of the men had gone home, as they leave at 5 in the morning. They live scattered all over town, so I thought it would be next to impossible to get them together and up here on the hill without advertising the fact to everyone. Further, as Martinez never entered town for the purpose of robbing, and as no robbing was going on in town, I thought it might be just as well not to have men here who probably would not fight anyway.

"Martinez got a car and a man to drive it, and they moved around all over town, finally winding up at a merchant's where they knew there was a passenger truck. As he drove through the streets all the boys and kids were trailing along behind and making a regular fiesta of the affair. All this time no one made a move to get a crowd together to drive them from town, except the presidente's wife. She went to all those that were at all prominent in business or held any office, but they all said that they could not mix in such an affair. As soon as I could raise the station agent by phone I got him to wire Mazatlan. He said that there were sixty men here, so General Aguirre came out with a special train and 300 men. It took so long to get the train made up he did not arrive until nearly 2 in the afternoon. He was pretty well disgusted when he found that the message he had received had exaggerated the number, because, as he said, he could have been here hours earlier with some thirty men in trucks.

"After the Martinez crowd got the truck going they all piled in and started for Cacolatan, the little town about 10 miles up the river, but as they were going by the mining company's plant the men said to Martinez, 'We are going away empty-handed; let's go and make a loan from the mine.' This is what the boy who drove the truck tells us. Martinez argued with them that he had no grudge against the company, but they insisted; so the truck with twelve of them drove up to the office. They all piled out and Martinez pulled off his hat and came up to shake hands with me as I was standing in front of the office door. We talked a moment and finally I asked him what I could do for him. He said, 'It gives me much pain, but we need money and I must ask you for it. We must have 8,000 pesos.' He thought that even though we did not have that amount in the vault we could send down town and gather it for him. Finally we compromised on 2,000 pesos. He shook hands all around, sent his regards to the father of the girls in the office, assured me that he would not trouble us again, climbed in the truck, and away they went. Absolutely the most ridiculous thing one could imagine. At the same time we were all helpless to do a thing.

"As near as we can make out from talking with different people who saw them and heard what was going on, Martinez came to town to gather what arms he could, but the main reason was to hold up and disarm the local authorities and make them ridiculous in the eyes of everyone. They surely succeeded. They did not offer to stop anyone who was going to work nor bother anyone who did not carry arms.

"There were many funny incidents that we are hearing as time goes on. One is that they opened the jail and let all the prisoners out. There were about ten, but the same afternoon and today they have all been put back but one because they were hanging around the plaza. Only one man ran away.

"Martinez sent the truck back by the boy and returned some of the guns taken from the police that were too poor for him to keep. He also sent 20 pesos to pay for the use of the truck.

"The man is a sort of a Robin Hood to the people here, and it is no wonder that they would not gather to attack him. None of them feel any resentment against him for what he did, nor do they blame him much for the killing he has done. They all say that he was robbed by the courts of the land that he had, at the instigation of the one family.

"We have been without troops in town since Sept. 16. We now have thirty stationed in town besides those that are in the hills. The general assured me that he would leave them here all the time now. We have asked for troops several times in the last month, but he always said that he did not have them to spare, as they were all needed in Sonora.

"Unless they are going to clean up this district I don't know how we are ever going to be sure that we will get through from one day to the next with money for the payroll. We have the bars in the office tonight and will have some of the soldiers stay up here until we ship them in the morning. We have been sleeping under guard for the last year, and now it looks as though we would have to have troops on duty both day and night. However, if they will leave the troops in town there is not much chance that another band will come in as they did yesterday, but at the same time we are far enough away from the center of town to permit of a band sticking us up almost any time without anyone knowing about it until it was over."

Petroleum Recovery

THE EDITOR:

Sir—In the *Engineering and Mining Journal* of Sept. 18 last your editorial referring to the petroleum report makes me think that perhaps you might be interested in the efforts which I have made to introduce a method to recover the oil remaining in pumped-out oil pools. For your information I am sending a copy of a letter addressed to the —— Sulphur Co., which gives the outline of the process. Nothing has been done with it so far.

HIRAM W. HIXON.

Paris, France.

The letter referred to by Mr. Hixon follows:

"As you are probably aware, there is only a small portion of the petroleum recovered from oil sands by the present methods of production. As estimated by the Committee of Eleven of the Petroleum Institute, there are still left in exhausted oil fields 26,000,000,000 bbl. of petroleum which is recoverable at a price, but not at the present price in competition with flowing wells. Looking to the future, when of necessity the price of petroleum must and will be much higher, I have designed and patented a process for recovering petroleum from oil sands by steaming them under pressure and at the same time pumping out the condensed water. The removal of the water is the essential point, as otherwise the hole fills with water from the condensing steam and further operations are stopped.

"In your operations of recovering sulphur the hot water remains at the bottom of the well, taking the place of the sulphur which is melted and forced out of the discharge pipe. In your case, the sulphur flows upward surrounded by hot water or steam, which keeps it molten. In the case of the petroleum recovery the condensed steam could be removed in the same manner as the sulphur; but then the water would be surrounded by the steam and leave the well at the same temperature at which the water entered it. This would not be economical; therefore it becomes necessary to have a steaming well and a pumping well close together, so that they can be connected at the bottom of the oil sand. This connection can be effected if the wells are not more than 6 ft. apart, by shooting the wells with dynamite or nitroglycerine and cleaning out the loose or powdered material by means of a sand pump or by compressed air. Oil wells have been steamed for many years for the purpose of melting the paraffine that accumulates in the sand pores near the hole, thereby obstructing the flow of petroleum into the hole. This steaming has been done in an open hole with no effort to remove the condensed water until after the removal of the steam pipe.

"The process was not steaming under pressure with the simultaneous removal of the accumulated water. For this reason the live steam could not be made to act on the oil sand for any considerable distance from the hole.

"We have now to consider what will be the effect of the action of steam on the oil in the sand when the condensed water is removed. My plan would be to select a pumped-out oil pool, the history of which showed that it had been very productive of a good grade of oil that would yield the maximum of gasoline, and so located as to be near the market. This could be found somewhere in Pennsylvania, Southwestern New York, or in West Virginia. Secure leases at the most advantageous royalities possible, and erect the steaming plant at a central point with relation to the oil pool and the supply of coal and water.

"Clean out the old wells and recase them or sink new ones from which to pump. At a point central in relation to four pumping wells drill two new wells about six feet apart down through the oil sand. Case them both to the top of the oil sand and make a steam-tight seal above the oil sand in both cases. Casing of the steaming-well should end at the top of the oil sand, while the casing of the other or an inner pipe should extend below the bottom of the oil sand, in order to facilitate the removal of the condensed water. This water would flow by gravity to the bottom of the discharge well and there be forced up a pipe to the surface by the pressure of the steam, or if necessary be assisted there by an air lift.

"At the surface it would pass through a closed tank for the removal of the heavy oil which might go along with it and from this oil-separator it would be forced back to the feed water of the boilers unless it contained salts which might injure the boilers. In the steaming well the steam would penetrate the oil sand and gasify the lighter fractions of the oil, causing them to expand and take the place of the steam which would be condensed to water. This would make a permanent gas pressure which would force the petroleum in the sand away from the steaming well toward the pumping wells, and after sufficient time the oil would be recovered there.

"The first effect on the pumping wells would be an increased recovery of gasoline, and the wells would have to be equipped to handle and recover that. The action of the plant would be similar to an oil refinery with the stills underground in the oil sands.

"Compressed air and flooding with water are used to increase the recovery from oil sands; but the result is only partial—about 5 to 6 per cent, while steaming will recover the maximum amount and approximate 99 per cent of the oil, a fact which can be demonstrated by a very simple experiment: Take a milk bottle or a carafe about half full of any heavy oil, and mark the point or line of the surface of the oil in the bottle. Take about two pounds of building sand on a paper lying on a table near a gas stove or jet. Make a ring of the sand on the paper with a sand bottom in the center of the ring. Pour the oil from the bottle on to the sand and roll it into the sand by raising the corners of the paper in succession. When the oil is thoroughly rolled into the sand, observe that no oil will drain out of the sand by gravity; nor can it be removed by water or air.

"Put the oil-sand mixture into a saucepan or boiler and cover it with hot water and boil it for five minutes above the gas. The oil and some sand will rise to the surface. Pour off the water and oil, straining through cheesecloth into a funnel in the mouth of the bottle, and note that in about fifteen minutes the oil, with small loss, is returned to the bottle.

"By no other means than that of the above experiment can the oil be separated from the sand and returned to the bottle, and also by no other means than the process I had previously outlined to you can the oil remaining in oil sands be recovered—short of mining, crushing, and boiling at the surface. A large margin of saving should be an item in favor of doing the work in place instead of at the surface.

"I am bringing this matter to your attention because of your experience with the Frasch process and because of the similarity and dissimilarity between the two; also because there exists a great field with enormous resources and an unlimited market for the product.

"As you know, in the opinion of many competent petroleum geologists the production of petroleum in the United States has passed its peak, and is due to decline because of the failure to bring in new oil pools, from which new pools 50 per cent of the current production is obtained. It would take years to develop adequate production from the exhausted pools in the manner described above, or in any other manner, granting that the work is a success from the beginning; and meantime if flush production from new pools does not appear, the price of oil is going to rise rapidly, which would give an even better market than at present exists. The United States produces 70 per cent of the petroleum of the world, and a decrease of any great amount in its production is going to have a world-wide effect.

The Situation in Mexico

THE EDITOR:

Sir—In the issue of Jan. 8 there is an article by Mr. Jackowski on the situation in Mexico. The author says that the value of ecclesiastical property in Mexico is half a billion pesos. For the information of your readers I wish to call attention to the fact that the Church owns no property in Mexico, nor has it owned any since 1857. All property used for religious purposes has belonged to the government since that year. I make this correction because from the article one would infer that the present government of Mexico has confiscated Church property.

DOLORES FUERTES DE LA BARRIGA.

Juarez, Chihuahua, Mexico.

Cyanide Plant Control

THE EDITOR:

Sir—Referring to the article entitled "Concentration of Solution Values in Evaporating Cyanide Pulp Samples," in your issue of Dec. 25, Mr. Tyrrell has brought forth one of the several bugbears that confront the cyanide plant operator in his efforts to obtain concordant assay results, and has given the remedy as applied at the Kirkland Lake Gold Mines. Reliable information is of vital importance to the operator who strives for intelligent control of plant operation and for a close check of his daily recovery calculations against actual bullion returns.

In an effort to correct the same source of error as described by Mr. Tyrrell, another method of preparing pulp samples for assay has been used for some time, a description of which, along with its application to plant practice, might be of interest:

Routine and special pulp samples are charged into a pressure filter, and the solution is filtered off and caught in a sample bottle and retained for assay. After filtration is complete the residue is given one or more water washes, according to the known approximate solution enrichment, to replace pregnant moisture remaining in the cake, after which it is transferred to an enamel-ware pan and evaporated to dryness with the aid of a low heat. We now have a "pulp solution" and a "washed pulp" representing the original "wet-pulp" sample.

Another factor in plant operation is that of careful control and maintenance of required dilutions throughout, which is also a matter of constant plant record. In computing assay returns, the per-ton assay value of the original or "wet-pulp" sample = "pulp solution" value × ratio of solution to ore + "washed pulp" value; or, assuming the ratio of solution to ore in the "wet pulp" to be 2.37 : 1.00, the assay value of "pulp solution," $3.10, and the assay value of washed pulp, $8.68, then the assay value of the "wet pulp" = 3.10 × 2.37 + 8.68 = $16.03.

Since the objective in cyanidation is the final depletion of the valuable metals in ore through solution enrichment, it is obvious that the information required in the cases of a pulp entering into and discharging from an agitator circuit; counter-current and thickener underflows; filter feeds; and tailing discharges, can be had from the assay sheet by direct reading. Another advantage is that the inaccuracies which arise from "spitting" in evaporating down a "wet pulp," especially one containing high-grade solution, are entirely eliminated, since the residue, or "washed pulp," contains only 15 per cent to 18 per cent moisture when taken from the filter.

In mill practice the work in preparing samples for assay as outlined above is a matter of planned routine, and is usually performed by one of the solution shiftmen, or, in the larger plants, by a sampler. The necessary equipment consists of a filter large enough to receive the largest 24-hour sample; a sample drier; a supply of filter cloths (each sample should be filtered through a fresh cloth, and the cloths scrubbed before again used); also a supply of large-diameter (about 16 in.) filter paper and a supply of bottles and enamel-ware pans to which metal tags stamped to indicate the particular sample are attached. Measurement of the "pulp-solution" sample, for assay by the usual precipitation or Chiddy method, and quartering of the "washed-pulp" sample, is performed in the assay laboratory.

In having pulp samples prepared in this way it has been my good fortune to obtain reliable information for purposes of plant operation; and with the use of bullion plus tailing and another method of recovery calculation, described by myself in the *E. & M. J.-P.* of Aug. 18, 1923, to check closely actual bullion production, and to determine the true ore head, as well. W. A. LINFESTY.

Hayden, Ariz.

As a Prospector Sees Mining

THE EDITOR:

Sir—Recent discussion in the *Engineering and Mining Journal* as to how the lawyer, the engineer, and the P.M.E. see mining has encouraged me to express my view as to the business branch of mining. One who frequently comes in personal contact with the average mining scout or engineer realizes that he is an average specimen of mankind, who in most cases is dominated and controlled by the formula rule of his employer, just as the lawyer is controlled by inconsistent but permissible technicalities in civil-law practice.

Therefore the payroll scout in behalf of his livelihood must be intent upon fulfilling the requirements of his master, rather than being free to exercise his initiative and judgment in each individual case, because almost anyone knows that mineral deposits are just as far afield in variance of quality as any other estate or commodity, which justifies a flexible open plan of approach.

Not so long ago I had an experience with one of those payroll scouts owned by a big rich Idaho mining corporation, who after having the property secretly examined, presented me with the formula lease-option contract with himself personally, no payment, five years' time, arbitrarily suggesting a royalty of 5c. per pound on a product having a present low market price of 57½c. per pound; and not one essential protective clause in favor of the owner. It is needless to say that no deal was consummated.

On the other hand, had that scout been free to say, "you have a prospect of merit, but we do not desire that the owner should attempt the appraisal of its future worth, which is more than we ourselves can do. But we will allow you to gamble to the end with us upon a fair percentage royalty basis, as the word greed is not used in our vocabulary," how different this arrangement would sound to the owner.

For illustration, most of the provinces of Canada containing minerals retain a gross royalty of 10 per cent of the assay value of all ores mined. Notwithstanding this burden, together with other natural disadvantages, their mineral production continues to show big gains each year, which is not only instrumental in attracting the American prospectors, but also hundreds of millions of the American speculative dollars annually.

What we most need is for the state and government to take more interest and to exercise closer supervision in the business of mining, because in the final analysis we find that between the high-handed performance of the wildcatter and the cold-blooded disposition of a few big, rich mining corporations, the prospector's business is fast being forced to a foreclosure.

Most of us prospectors out here have been without money so long that should we find a gold brick we would hardly have the courage to ask for a cash payment on it. V. A. TAMNEY.

Reno, Nev.

Consultation

Lubricating Hoist Brake Blocks

"Can you tell me what practice should be recommended for lubricating the brake blocks or brake linings of mine hoists? Should they be lubricated and what lubricant should be used?

"One master mechanic whose opinion I value highly stated that it meant a great deal to the life of brake blocks to keep them well lubricated and recommended high-grade steam-cylinder oil. I have talked with officials of other large mining companies who never heard of lubricating the blocks. I might add that one of these companies wears out the brake blocks and brake drums very rapidly.

The above inquiry was published in the *E. & M. J.* of Jan. 1, with an invitation to operators to record their experiences. The following are among the letters received:

"It is probable that most hoist operators have experienced to a lesser or greater extent a 'grabby' brake, caused most often by lubricating grease or oils coming in contact with the wearing surface of the brake blocks. Experience will teach that while the brake lining is warm this grease or oil will cause smooth operation, but where the heat caused through friction becomes intense, or when the brake blocks again become cool the tendency will be for the blocks to 'grab.' Paraffine, combinations of oils, soap, and many other remedies have been tried with about the same unsatisfactory results for smooth braking over an extended period of time. At our mine in Arizona I have used and have closely observed the results of using pure neatsfoot oil upon brake blocks. I have found that this oil does away with the usual 'grabbing' of the brake, gives a good glaze to the blocks, and diminishes the wear; and that at the same time it eliminates the uneasiness of the miner who has to ride at the end of a jerky cable."

"At our mine in Nevada operating to a depth of 1,500 ft. we do not lubricate the brake blocks. We have purchased only two sets of brake blocks since 1912. On Dec. 3 of that year we had a new set of blocks on a single-drum hoist operating to a depth of 1,200 ft. in direct balance at a rope speed of 800 ft. per minute both ways. In 1922 the shaft was sunk 300 ft. deeper, and another set of brake blocks was purchased. They were of wood. In the latter part of 1924 we purchased a set of special fiber brake blocks, which have since been in operation on the hoist (about eighteen months), and they are not worn smooth or to fit even a groove that was scratched in the brake drum some years ago. We are using a ⅞ in. hoisting rope and a skip having a net weight of 2,800 lb., hoisting 33 cu.ft. of rock as a load. The shaft is vertical.

"This brake block saving is due to the counterbalancing of the skip. The skip does not accelerate beyond the running speed of 800 ft. per minute, and the brakes are used only for the purpose of stopping the skip and holding it. Previous to installing the counterbalance in 1912 we wore out a set of poplar brake blocks about every ninety days."

"Force Majeure" in Smelting Contracts

"What is the significance of the so-called *force majeure* clause in the contract of a mining company to sell its ore to a custom smelter?"

During the period when high prices for supplies and high wages prevailed, and smelting operations were curtailed because of the smaller ore shipments in 1919 and 1920, several of the Western smelters found that they were losing money on ores shipped under the terms of contracts that had been made ten or fifteen years before. They desired to escape from these contracts and attempted to bring into operation the *force majeure* clauses in the old agreements. The mining companies resisted and went to court in the matter, but finally agreed on a compromise. Since that time new contracts have contained more comprehensive clauses of this character, one of which reads as follows:

"As the seller is under no obligation to produce and ship ore at a loss, the seller similarly grants the buyer reasonable protection in purchasing ore under this contract, and therefore it is understood that if, during the contractural period, the cost of smelting and refining shall increase to an extent resulting in financial loss to the buyer in treating the seller's product, then the buyer shall have the privilege, without liability for damages, at any time after one year from date, of canceling this contract, subject to thirty days' notice to the seller."

The Source of Salt

"What is the source of most of the common salt (NaCl) used in the domestic market?"

The statistics for 1925 show that the total consumption of salt in the United States was 7,397,498 tons, having a gross value of $26,162,000. Of this slightly over one-third, or 38 per cent, was contained in brine used directly in chemical works for the manufacture of various products; something less than one-third was mined in the form of rock salt; and a still smaller quantity was obtained and [illegible]ned in solid form after evaporation from brine. T[illegible]incipal salt-producing states, in their order of importance, were: Michigan, New York, Ohio, Kansas, Louisiana, California, Texas, and Utah. An interesting point is that the salt industry of Syracuse, N. Y., at one time the source of a large part of the production from the state, has virtually died out, being unable to withstand the competition of other areas where production is more economical.

Bolivian Tin for Solder

"I desire to secure some information on Bolivian tin ores and the ease and comparative cost with which they can be refined in comparison with those of other sources, such as Straits. We would also be glad to have any information on the suitability of the Bolivian tin for solder purposes."

In connection with this query, published originally in the *Engineering and Mining Journal* of Nov. 27, 1926, Messrs. M. Lissauer & Co., Elisenstr. 17-19, Cologne, Germany, have written as follows:

"We have read the inquiry concerning the applicability of Bolivian tin ore for soldering tin. This is of interest to us, and we should appreciate it very much if you would point out to the inquirer that we are constantly in the market for low-percentage Bolivian tin ores containing 30 to 40 per cent tin for the manufacture of soldering tin. We wish to call particular attention to the fact that sulphur, lead, and antimony in this ore do not make any difference to us, but silver, it is true, would not be paid for."

News of the Week

Summary

HOUSE COMMITTEE cuts Bureau of Mines appropriation relating to economic surveys of mining industry—Mining school established in India.

Anaconda Copper Mining Co. wins Carson patent suit; case to be appealed to U. S. Circuit Court of Appeals.

United Verde concentrator nears completion—Big Jim milling 80 tons per day—Iron Cap results not encouraging.

Explosion of air compressor at Shattuck-Denn plant—Kay Copper reports high-grade ore.

North Lily shipping high-grade lead ore—Utah's zinc production 92,000,000 lb. in 1926.

First shipment of mercury from Morton, Wash.—Moffat tunnel nears completion.

Portland Gold testing new process—Rico Mining opens lead-zinc deposit.

Mexican metal mines but little disturbed by so-called revolution; much interest shown in mercury.

Spanish iron mining depressed—New tin companies formed—Cornwall prospects bright.

South Africa retains interest in diamonds and platinum; Chamber of Mines to check spread of tuberculosis.

New dredging regulations for western Canada—Cheaper power in sight for Kirkland Lake.

Custom Mills for the Coeur d'Alene

It is possible that before long custom mills for the treatment of what was formerly designated as complex zinc-lead ores will be operated quite as extensively in the Coeur d'Alene district, Idaho, as they are now in Utah. The International smelter, in Utah, was in need of lead ores, and decided to build a large custom mill for the treatment of lead-zinc ores. The International smelter being owned by the Anaconda company, the zinc product of the mill was shipped to the company's electrolytic zinc plant at Great Falls, and the lead product was turned to the International smelter.

The situation of the Bunker Hill & Sullivan company with reference to the zinc-lead ores of the Coeur d'Alene district is somewhat similar to that of Anaconda toward the Utah ores. Bunker Hill has its lead smelter, which could take care of much additional ore. It is also half owner of the electrolytic zinc plant now under construction near the lead smelter at Kellogg. Though the first unit of the zinc plant is designed to handle the zinc product of the Star mine, official announcement has been made that additional units will be built to handle custom business. To get this custom business, it follows that the Bunker Hill, with possibly some assistance from the Hecla, must provide custom milling facilities, and by doing so it will have the advantage of securing much additional tonnage for its lead smelter while providing zinc concentrate for the electrolytic plant. The company has already remodeled half of the Sweeny mill for custom service, and that mill is now handling the zinc-lead ore from the Sidney mine.

Independent of the local smelting interests, the Hercules Mining company is also making a bid for milling zinc-lead ores on a custom basis. Since the exhaustion of the Hercules mine, the company's mill at Wallace has been idle. Recently it has been divided into units and flotation equipment added to recover zinc in addition to lead. The Hercules management has announced that zinc-lead ores in small lots will be accepted for treatment on a custom basis, and if results prove satisfactory additional capacity will be provided to do a custom business on a large scale. What disposition the Hercules will make of its zinc concentrate does not yet appear, but it is presumed that shipment will be made to the Anaconda plant at Great Falls.

Moctezuma Copper Wins Douglas Safety Trophy

INDUSTRIAL ACCIDENTS among employees of subsidiary companies of the Phelps Dodge Corporation during 1926 were reduced more than 50 per cent under the figures of the preceding year, as a result of a well-defined safety program which has been faithfully carried out, with the co-operation of the hundreds of employees of the corporation. This fact was disclosed at a recent meeting in Morenci, at which the combined reports from all the branches were presented.

The James Douglas memorial safety trophy, awarded annually to the branch of the Phelps Dodge Corporation which has the fewest number of time-lost accidents among its employees during the year, went to the Moctezuma Copper Co., which completed a remarkable record on Dec. 31, 1926. The Moctezuma Copper Co., which won the annual trophy for minimum lost-time accidents during the year, employs Mexican labor exclusively, indicating that success in safety work is not dependent on nationality or the class of labor.

Idaho Copper Corporation Denied New Trial

The Idaho Copper Corporation has again lost, in its half-million dollar libel suit against Stewart Campbell, State Mine Inspector of Idaho. In the trial of the case the jury returned a verdict completely exonerating the inspector. The verdict against the company was followed by a motion for a new trial, which has now been denied by Judge Deitrich, in the U. S. District Court, Boise, Idaho, who in making his ruling indulged in this interesting comment:

"I have no question that while the evidence was in a measure circumstantial, it was abundant to support a finding by the jury that the articles in the *Iconoclast* were published with the knowledge, consent, and encouragement, and indirectly by procurement, of plaintiff; and, furthermore, that the jury was amply warranted in finding from all the evidence, including that furnished by the publications themselves, that the representations made were substantially of the character charged in the alleged libelous writings. For the purpose of showing that the verdict is supported by the evidence, it would be interesting to analyze these articles and to explain the history of the promotion and the means by which investment in stock was made alluring to unsophisticated purchasers, but at this juncture that is not thought to be necessary."

Belgian Smelters Do Not Want Idaho Lead

About two years ago the smelters in Belgium were short on zinc, and representatives of the Vielle Montagne Zinc Co., of Chenee, Belgium, spent considerable time in the Coeur d'Alene district, Idaho, closing contracts with several mining companies for their zinc product. Among these was the High-

land-Surprise Consolidated Mining Co., operating on Pine Creek. The Highland contract provided, among other things, that the zinc concentrate for export to Belgium should contain not to exceed 7 per cent lead, and also that all lead above 4 per cent would be paid for. The Highland-Surprise Co. has not been able to produce a zinc concentrate containing less than 10 per cent lead, and shipments have been proceeding for more than a year and a half without protest on the part of the smelting company and payment has been made for all lead above 4 per cent. Now, the Vielle Montagne company has notified the Highland company that future shipments must conform to the contract with respect to the lead content, and further that settlement for all former shipments must be readjusted on that basis. As the Highland company, with its present flotation facilities, cannot produce zinc concentrate with only 7 per cent lead, and because readjustment of settlement for former shipments would compel a refund of probably between $30,000 and $40,000, the company has of necessity declined the new terms, which may result in suspension of production. The position of the mining company has been reported by the Belgian representative to the home office, from which a decision is expected soon. In the meantime Highland shipments are proceeding as usual.

The contract will expire on April 1. Almost coincident with this contract controversy, the Highland-Surprise company struck an oreshoot 12 ft. wide, containing about 3 ft. of high-grade ore that contains 45 per cent zinc.

Golden Eagle Driving 800-Ft. Tunnel

A new tunnel is being driven at an additional depth of 150 ft. on the Golden Eagle at Pierce City, Idaho. It is in 160 ft. and must go 640 ft. more to pick up the orebody found on the No. 2 level above. On the No. 2 the ore has a depth of 850 ft. on the vein. George Hottenstein is acting president of the Golden Eagle Mining Co. Among other properties in the district which are working a few men this winter are the American Eagle and Black Pine.

Iron Cap Results Not Promising

The Iron Cap Copper Co., Copper Hill, Ariz., has issued a report to stockholders covering production of copper for the third quarter of 1926. Copper amounting to 1,136,875 lb. was produced, with a balance of income over expenses of $17,444.

It is evident from the report that little can be expected from now on from the copper property. The Iron Cap mill has been shut down, and only a small amount of ore is being shipped direct to the smelter. For some time past the Iron Cap management has been concentrating efforts toward the development of a new company known as the Mineral Products Co., which owns a feldspar mine. The Mineral Products Co. also has acquired a sizable interest in the Christmas mine, near Winkelman, Ariz. This mine has reported shipping 3,000 tons monthly.

North Lily Ships Nine Cars of High-Grade Ore

Assays of ore shipped in the first nine carloads from the new strike in the North Lily mine, near the Tintic Standard, at Eureka, Utah, ranged from 14 to 20 per cent lead; from 11 to 29 oz. of silver to the ton; and from $2 to $7.20 in gold. None of this ore was sorted, but was dumped into the cars just as it was loaded by the mucking machine. Practically all of it was derived from drifting operations through the 113 ft. deposit pierced in the International Smelting Co.'s property and all within a week after the first strike was made.

Whether the deposit has been crosscut or its strike traversed is a matter of conjecture. Stoping has been begun to prove the grade, extent, and nature of the ore occurrence. Values are found in the form of cerussite, anglesite, and galena.

Utah Zinc Production in 1926

Utah's production of zinc made a significant advance from 52,611,732 lb. in 1925 to 92,000,000 lb. in 1926. The value of this zinc output practically doubled, from $3,998,492 to $6,752,000. Increased activity at the custom plant of the International Smelting Co. at Tooele, increase of capacity at the Midvale plant of the United States Smelting Co., installation of zinc flotation units at the Utah Apex, the Silver King Coalition, and Chief Consolidated, and the steady large-scale operations at the Combined Metals Reduction at Bauer were factors contributing to the improvement. It is estimated that 11,200 tons of zinc concentrate a month, mostly derived from Utah ores, was shipped out of the state from custom and private mills.

Anaconda Wins Carson Patent Suit

The Federal Court at Butte, Mont., has returned a ruling in favor of the Anaconda Copper Mining Co., in its suit attacking the validity of the Carson ore-furnace patents, which the United States Cicuit Court of Appeals at San Francisco last year decided were valid, and on which George C. Carson, the inventor, was declared entitled to large sums for alleged violation of his rights. Judge Bourquin ruled that the operation of furnaces at Dollar Bay, Mich., in 1905 and 1906, constituted a prior public use of the "side-feeding" furnace device patented by Mr. Carson in 1915 to take the place of the old-style hand-stoking method. The court suggested, however, that if the patents were later found valid infringement to a certain extent might be established.

Announcement has been made by John H. Miller, attorney for the Carson Investment Co., that the decision in favor of the Anaconda Copper Mining Co., given by Judge Bourquin on Jan. 24, 1927, will be appealed to the United States Circuit Court of Appeals. It is of interest to note that the court before which the appeal is to be heard is the same court which reversed the decision given in the Tacoma case in a similar suit conducted by G. C. Carson and his attorneys in the side-feeding reverberatory patents owned by Carson and his associates. There is thus presented the interesting situation of a federal court of appeals reopening a similar case to one which it had previously reversed and settled. In this instance the patent infringement proceedings were against the American Smelting & Refining Co. The present suit by the Carson Investment Co. was tried in Butte early in October, 1926, and was decided in favor of the defendants, the Anaconda Copper Mining Company.

United Verde Concentrator Nearly Ready for Operation

The United Verde Copper Co.'s new concentrator, Jerome, Ariz., will have a capacity of 1,200 to 1,400 tons of ore per day, which, based on the experimental work done in 1924, will produce over 500 tons of concentrates. This means that approximately 800 tons of waste material will be delivered daily to the tailings pond.

It is not expected that the new concentrator will increase the amount of copper produced; it is merely to reduce the over-all cost of production, with certain other incidental benefits. The plant will be operating within the next few weeks.

Superior & Boston to Suspend Operations

According to reports, the Superior & Boston Copper Mining Co., Copper Hill, Ariz., will suspend operations within a short time. During its day the mine enjoyed periods of prosperity, but of late years no dividends have been paid and the little money received from sales of ore has been expended in development work in the hope of striking more and richer ore. Men working for the company will not be dismissed immediately, it is stated, but will be let go gradually, leaving a few men to work out the ore that still remains.

Big Jim Milling 80 Tons per Day

Operation of the mill at the Big Jim mine, at Patagonia, Ariz., has been increased from sixteen hours a day to twenty-four. The mine is producing eighty tons of lead-silver ore per day, from three levels above the 250 level. A tonnage of broken ore sufficient to run the mill for ten months is said to be ready for drawing from the stopes. The shaft is being sunk from the 250 to the 450 level, and has reached a depth of 300 ft. George Keating is president of the company, which also owns the Bluebird group of claims, at Oatman.

Heckscher Wins Suit for Zinc-Mine Profits

Suit brought against August Heckscher, of New York, the New York Zinc Co. and the Northern Ore Co., by Thomas M. Williams, an engineer of Dover, N. J., was dismissed on Jan. 26 by Federal Judge Moscowitz at New York. The suit involved zinc-mine profits back to 1903, when Mr. Williams and Mr. Heckscher were in partnership in the ownership of a mine.

News From Washington

By PAUL WOOTON
Special Correspondent

House Committee Cuts Bureau of Mines Appropriations—Economic Surveys Stressed by Turner

Economic studies of subjects recommended by representatives of the mining industry did not meet with favor among the members of the subcommittee of the House appropriations committee in charge of the Commerce Department appropriation bill. The subcommittee struck out the $30,000 of additional funds requested for the study of the commercial problems of the mineral industry. The effect of this, if it is not corrected in the Senate, would mean less economic work than has been performed heretofore. The committee evidently reached the conclusion that the Bureau of Mines is trying to encroach upon the field of the Bureau of Foreign and Domestic Commerce.

Director Turner assured the committee that there would be no duplication of the work being performed by the Bureau of Foreign and Domestic Commerce. He explained that one of the recommendations from the mining industry, through the Reynders committee, was that studies be made of the economics of the mineral industries. All that is being done now, he explained, is a recording of production without regard to market demands, distribution, consumption, stocks, and new sources of supply. Extracts from Director Turner's remarks to the committee follow:

"The mining industry feels that it is entitled to surveys of an economic character, as well as the purely technical service we have been giving it. Secretary Hoover is of the same opinion. All mineral work of the Department of Commerce has been transferred to the Bureau of Mines in order to put it under one head and in one place.

"The new money would be used for economic surveys which would result in putting periodic analyses in the hands of the producers of certain minerals and mineral products. The service would undertake occasional surveys of trade conditions, occasional surveys of market demands, and the possibilities of new fields. We hope that eventually every one producing any mineral product may get some small service from this Bureau regarding the business side of his venture. We can furnish a central clearing house for the figures of production and the figures of demand and supply, and the facts relating to the trends of the market can be put together in an impartial way. This is the crystallization of a demand which has been growing in the industry for some years. We are just trying to supply it and we are asking for funds to make a modest start."

The real fight over adequate appropriations to start on the program outlined by the Reynders committee will come in the Senate, where the groundwork has been laid for a thorough discussion of the matter. That the metal-mining industry is taking notice of the matter is indicated by the fact that many Senators are being urged by prominent mining men to support the program for economic studies.

Representative Arentz, of Nevada, has introduced in the House a bill identical with that which Senator Oddie introduced in the Senate authorizing additional appropriations for the Bureau of Mines. If approved the effect of the legislation would be to add $185,500 to the Bureau's funds.

Mining School Established in India

Lord Irwin, Viceroy of India, opened in the second week of December an up-to-date and adequately equipped school of mines at Dhanbad, which is in the heart of the coal-field area a few miles from Calcutta. The institution is known as the Indian School of Mines.

The establishment of a college for the training of mining engineers and geologists has been considered from time to time by various bodies, the final preparatory step being taken by the Government of India in 1920, when it was decided to form a school of mines to meet the educational needs of the whole of India, so far as mining, engineering, and geology are concerned. The buildings were begun in 1924, and sufficient progress had been made during the following years to enable a start to be made this winter with the courses of instruction. It will be the aim of the governing body of the Indian School of Mines to provide instruction of a grade equal to that provided at the Royal School of Mines, London, and with that end in view a correspondingly high standard was decided on with regard to entrance examination requirements.

Nearly two hundred students applied for admission to the school, and out of over one hundred and fifty who sat for the entrance examination, fifty were selected as being suitable for enrollment. These include students from practically every province in India. Much of the work connected with the design and equipment of the school, its laboratories, and the workshops attached to it has been carried out by Dr. D. Penman, the principal.

Rockbridge Manganese Opens Old Mines

After remaining idle for some years, the Rockbridge Manganese Co., located near Midvale, Va., is putting the old mines in condition for early production on a large scale. Development is under the direction of Marshall Haney, mining engineer.

The tin mines on Irish Creek are being reopened. This is one of the few tin properties in the United States, and is supposed to be a continuation of the tin deposits from Kings Mountain, N. C.

Explosion of Air Compressor at Shattuck-Denn Plant

A large air compressor at the Denn shaft of the Shattuck-Denn Mining Co. recently exploded, without warning, during the day shift. The force of the explosion hurled one of the employees, Richard La More, through the east wall of the compressor building, killing him instantly. Parts of the apparatus were widely scattered, endangering other workmen in both the hoist and compressor rooms.

Since the installation of this compressor, several months ago, considerable work had been done on the machine in an effort to remove a bearing knock. On the day of the explosion the machine had been started and stopped repeatedly, and had been started about three minutes before the explosion occurred. In starting the machine, the discharge valve from the compressor to the receivers had been started by one employee, while the victim of the explosion had thrown the starting switch.

L. E. Kelly, engineer for the machinery company, from which the compressor was purchased, offered as his theory that the explosion was caused by an obstruction in the air line between the compressor itself and the air receiver. The discharge valve from the compressor, he stated, showed that it had been partially broken for some time, and an examination immediately after the explosion revealed it to be completely broken.

Blue Ribbon Mine Sold

M. E. Richards, of Michigan, has purchased an interest in the Blue Ribbon mine, near Hockerville, in the Joplin-Miami field, and has assumed active management. The Blue Ribbon was owned and operated by H. H. Hawkins, of Baxter Springs, Kan., and has been a good producer for the last five or six years. Extensive improvements are being made to the mill.

Alaska Mining Notes

The Cann gold-quartz mine on Chichagof Island, Alaska, produced gold valued at $160,000 in 1926, being a slight increase over the record for the previous year. Extensive development has also resulted in a large increase in the reserves.

The Elmes Gold Mining Co., Fairbanks, plans to start its ten-stamp mill at the Happy mine in March.

Willow Creek district production is said to be $100,000 over 1925, the Fern Gold Mining Co., of Spokane, being the largest operator. Total output for 1926 is valued at over $600,000. Of this amount the Lucky Shot mine accounted for about $400,000. The Willow Creek mines operated the War Baby mine. Gold Bullion, owned by Willow Creek Mines, was worked on lease at a profit of about $20,000. The Mabel mine, operated by C. Bartholf and W. S. Horning, took out around $17,000.

The American Creek Dredging Co. has purchased a plant, and it is now being shipped to American Creek, in the Hot Springs district, where it will be placed in operation the coming summer.

First Shipment of Mercury From Mine at Morton, Wash.

On Saturday, Jan. 15, a shipment of seventy iron flasks, each containing 75 lb. of mercury, was received at the port piers of Tacoma, Wash., and loaded on the SS. "Willfaro," of the Williams Line, for New York. The mercury in each flask is worth $96.90, making the value of the entire shipment worth $6,783, or $1.27 per pound. Although this is the first shipment from the Morton mines, it is expected to be the beginning of a continuous mercury traffic between Tacoma and New York. The Morton mines are 61 miles from Tacoma.

Cripple Creek Notes

The U.G.I. Development Co., Cripple Creek, Colo., operating a large group of claims on Iron Clad Hill, has purchased complete electrical equipment for the operation of the Newark shaft. Present plans are to open up the Newark shaft, which is now bottomed at 200 ft. and to sink an additional 200 ft., from which depth crosscuts will be driven to a number of the known veins.

The Cudahy Gold Mining Co., Cripple Creek, Colo., which operates on Tenderfoot Hill, has retimbered the old main shaft on the Hoosier mine. Arrangements have been made for a compressor and hoist, and operations will be begun in two or three weeks.

Contrary to recent report, the Plutocrat claim at Cripple Creek, Colo., which is owned by A. A. Ammons, Cripple Creek, and leased to Nicoli and Benson, has not been re-leased or sold. The lessees, on the contrary, plan to order a compressor immediately. The lower tunnel is being driven ahead. Practically all the rock being taken out is ore and is being saved for shipment.

Rico Mining & Reduction Co. Opens Lead-Zinc Deposit

A strike of considerable importance was recently made on the Wellington property of the Rico Mining & Reduction Co., Rico, Colo. Systematic prospecting has been carried on in the hope that lead-zinc ore would be encountered beyond the pyrite. After driving through a drift for the last three months the lead-zinc ore has been encountered in sizable quantities. Plans of the Rico company for the thorough prospecting of the property should be productive of several orebodies.

Moffat Tunnel Nears Completion

The Moffat tunnel through the Continental Divide, which will save 175 miles of travel between Denver and Salt Lake City, will be formally opened for railroad service on July 1, 1927, according to latest report. This tunnel, the longest in America, is 6½ miles long, 24 ft. high, and 16 ft. wide.

Portland Gold Testing New Process

A new process for the concentration of gold and similar ores, using oil flotation with cyanide solution, and a process for the reduction of mill concentrates to bullion without roasting, have been invented and patented by John M. Tippett, superintendent of the Portland mill, at Victor, Colo., and are now being installed at the mill by the Portland Gold Mining Co. Mr. Tippett and his staff at the Portland have been experimenting on his new processes for the last twelve years. Laboratory tests have been very favorable, and mill runs will be made.

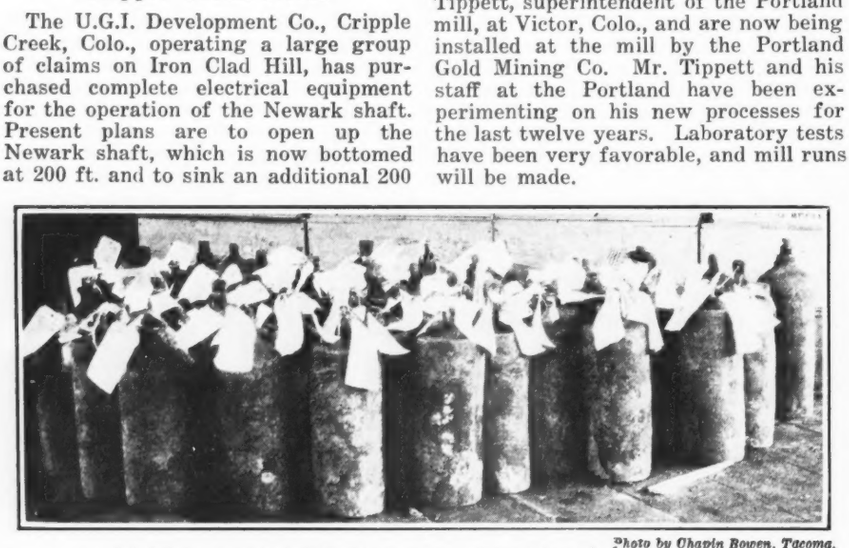


Photo by Chapin Bowen, Tacoma.

Shipment of 70 flasks of mercury from Morton, Washington

Lost Park Acquires Additional Property

The Lost Park Mining Co., Divide, Colo., under the leadership of C. M. Tucker and Melvin Cronenwett, has been acquiring abandoned properties around Divide with the view to reclaiming valuable ore. A force of about fifteen men has been employed on the various properties for some time. The company has discovered a valuable molybdenum deposit near the Red Skin claim, adjacent to the famous Black Prince and Tucker lode claim.

Great Gull Lake Copper Developing Orebody

The Great Gull Lake Copper Co., Ltd., Little Bay, Newfoundland, is reported to have developed, by drilling, a body of ore 1,400 ft. long, 75 ft. wide, and with a depth of 500 ft., assaying 2 to 2.75 per cent copper. Thomas E. Wells is president and managing director of the company.

Alabama Graphite Mines Resume

Some of the graphite mines near Talladega, Ga., which were operated during the high prices for graphite that obtained a few years ago, have again resumed operations, according to a recent report.

Endowment Mine Resumes Shipments

After a delay of several months occasioned by cloudbursts last August (which destroyed three miles of road) the Endowment Mine, Marietta, Nev., has resumed shipments. This property was taken over in 1923 by L. W. Whiting, of Mina, Nev., and equipped with hoist and compressor. Most of the time since has been devoted to development of the sulphide ores not touched by the "old-timers."

A small selective flotation mill will be erected at Marietta. Shipments of six cars of ore gave average returns as follows: Gold, $2.38; silver, 81.6 oz.; lead, 5.25 per cent; copper, 3.83; zinc, 7.6; iron, 13, and about 2 per cent antimony.

Mono Mine Closed for Winter

The Mono Mining Co. of Nevada, operating in California near Sweetwater, Nev., is reported to have unexpectedly closed down mine and mill for the winter, because deep snow interfered with tramway and mill operations. The company has expended large sums in equipping this property, and the natural assumption was that every precaution had been taken to insure continuous operation in spite of the customary hard winters.

Quincy Ore Improves with Depth

The Quincy company, Hancock, Mich., has cut its new, highly mineralized East lode in a winze at a point 100 ft. below the 87th level of No. 2 shaft. This is an important disclosure, inasmuch as the values are better than at the 87th. The lode was first cut at the 86th, and not only the persistence of mineralization with depth but the increase in copper content would indicate that the vein will become a valuable producer. No. 2 shaft, which was sunk two levels without stopping from the 87th, recently reached a point below the 89th. No. 6 has reached the 86th, having been sunk one level. Quincy's two operating shafts were sunk a total of 600 ft. in 1926, which is indicative of the extensive development program being carried out in the mine. Quincy's present rate of production is estimated at 1,200,000 lb. of refined copper per month.

West Gold to Erect Mill

Plans are now completed for the erection of the first unit of a 500-ton gold-treatment mill by the West Gold Mining Co. to treat the ore from its sylvanite mine at Idaho Springs, Colo. The company is now employing over fifty men and working two shifts. The shaft of the Sylvanite mine is about 180 ft. deep, and the station is being cut at the point where it will intersect the tunnel.

Copper for Auto Tags

A possible new use for copper is seen in a bill introduced in the Michigan Legislature providing for copper in the manufacture of automobile license plates. It is proposed to use the plates for seven years.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Ontario Ores Average $8.43 Per Ton During 1926—Power Conference for Kirkland Lake Area

The Ontario Bureau of Mines report on the gold production for December shows that 326,380 tons was treated, the recovery being $2,679,343, an average of $8.23 per ton. For the calendar year 1926 a total of 3,696,447 tons was treated, the recovery being $31,169,617, an average of $8.43 per ton. This is an increase of approximately $1,000,000 in gross output, compared with the record for the previous year. In the month of December the Porcupine mines treated 273,527 tons and recovered $1,960,936, an average of $7.18. In the same month the Kirkland mines treated 52,853 tons and recovered $718,407, an average of $13.60 a ton. For the year 1926 the average recovery from the Porcupine camp was $7.85 and from Kirkland $14 a ton. The December production of Kirkland mines represents an increase of 40 per cent over that for the previous December, whereas Porcupine shows a small decrease.

Additions have been made to the crushing equipment of the Tough-Oakes mine, of Kirkland Lake, which will permit the treatment of 200 tons a day. Mill heads during the last few months have averaged between $7 and $8 a ton, but on the lower tonnage the recovery was about sufficient to meet operating charges. With the increased tonnage it is expected that a moderate profit can be shown. Underground developments continue to be encouraging, and on the lower levels oreshoots are somewhat longer and a little higher in grade than on the upper levels.

It is estimated that for the quarter ended Dec. 31 last, production of the Lake Shore was $780,000, or at the rate of over $3,000,000 a year. The amount milled was 50,863 tons and the recovery per ton was $15.33.

It is expected that the new 200-ton mill of the Sylvanite Mines of Kirkland Lake will start operation about May 1. Stopes are being opened up underground, and as some of them are a considerable distance from the shaft, electric underground haulage will be used. A new 25-drill capacity air compressor will be purchased to speed up underground work.

It is understood that a conference will be held between Kirkland Lake mine managers and officials of the Northern Canada Power Corporation, to discuss power rates. Some time ago the mine managers engaged H. G. Acres, who was in charge of the Chippewa development for the Ontario Hydro-electric Power Commission, to make a complete survey of the power situation in Kirkland. This report has now been completed and indicates that the Kirkland companies are paying considerably more for power than any other mining camp in northern Ontario. In the meantime the Power company is making large expenditures to improve the service in the Kirkland district and to link up all the different power units throughout the North. The original power line from Cobalt to Kirkland is being rewired, which will substantially increase the capacity. A line is also being built to Kirkland from the Indian Chutes plant, and this is expected to be ready some time during the summer. These two changes will provide for a total of 19,000 hp. to the Kirkland camp. Further to safeguard this supply, frequency changers will be installed, to permit the use of power from the Quinze, if anything happens to the Kirkland lines. Cobalt and Kirkland use 60-cycle power; the Porcupine and Quinze developments are 25 cycle. The various changes and improvements which the Power company is making throughout northern Ontario as a whole involve the expenditure of approximately $2,000,000. This covers new lines into the Rouyn camp and sublines to such properties as the Amulet, Waite-Montgomery, and Alderson-McKay.

It is understood that recent drill holes on the Nipissing company's copper properties in Mountbray Township, Quebec, have given high values in gold. Officials are reticent about making statements, but it is known that they are exceedingly well pleased with the work done to date.

Diamond drilling has been started on the Jamieson copper property, lying to the northwest of Porcupine. Hollinger interests hold options on approximately 3,200 acres in this section, and on the main discovery mineralization has been disclosed over an area 600 x 1,200 ft. This is a large area of mineralization, and though it is not expected that the copper will be high grade, it may turn out to be an important property.

Lake Shore Operates at Increased Capacity

The capacity of the mill of the Lake Shore, in the Kirkland Lake area of northern Ontario, has been increased from 600 to 750 tons of ore per day, and it is now operating at that rate. Rich ore has been encountered below the 1,000 level. The shaft which is being put down to the 1,600 level has now reached a depth of 1,250 ft. In cutting a station at the 1,200 level No. 11 vein was encountered, values being about the same as at the 1,000 level. A winze which is being sunk from the 1,000 level on the No. 2 vein is now down 60 ft., at which point the ore is better than the average grade of the mine.

Wynchalit Gold Syndicate Organized

Montreal promoters, interested in properties in the Kamiskotia district of northern Ontario, have organized the Wynchalit Gold Syndicate. The syndicate has six claims totaling 240 acres in Carscallen township, about seventeen miles due west of Hollinger. Discovery of the claims was made more than two years ago by two prospectors, and two years' work has been done upon them. Option on the claims was secured by Brigadier General C. A. Smart.

Bunker Hill & Sullivan Opens Rich Ore at Chelmsford

Interest in the copper-zinc lead area near Chelmsford, in the Sudbury district of northern Ontario, has been revived by an important discovery of high-grade ore on the property now being operated by the Bunker Hill & Sullivan company. In a crosscut from the shaft at the 350 level a high-grade copper-zinc deposit was encountered having a width of 28 ft. The deposit is being opened in two directions.

The Sudbury Diamond Drill Co., which is associated with the Bunker Hill & Sullivan interests in the enterprise and holds a 10 per cent interest in the property, has done 60,000 ft. of diamond drilling upon it, and is said to have refused a large cash offer for its interest. Many claims in the neighborhood are being staked. The Sudbury Diamond Drill Co. has secured claims which include the bed of Vermilion Lake, situated about three miles from the Bunker Hill & Sullivan holdings. A large group of claims owned by A. J. Young has been sold to an American zinc-mining company, the name of which has been withheld.

Canadian Mineral Output Sets New Record

Canada's mineral industries yielded a new record output in 1926, when the value of production reached $242,886,000, an advance of 7.1 per cent above the total of $226,583,333 reported for 1925, according to the official estimate compiled by S. J. Cook, chief of the mining, metallurgical, and chemical branch of the Dominion Bureau of Statistics at Ottawa, and published in a preliminary report issued by the bureau. The previous high record of $227,859,665 was established in 1920.

Metal mining showed great strength and steadiness throughout the year. Production of copper, lead, and zinc reached new records; the output of silver was higher than in 1925; gold was steady, and nickel production was only slightly less than in the previous year.

New Dredging Regulations for Western Canada

Unprecedented activity in dredging the rivers of western Canada for minerals has caused the Federal Government to redraft the regulations which govern operations of this character and to reissue them in the form of an order-in-council. The new regulations authorize the Interior Department to lease a 5-mile stretch of river to an applicant. No person is eligible to acquire more than two leases, and a fee of $5 must accompany an application for a lease. If granted, the lessee must pay $50 for each mile of river leased for the first year and $10 per mile thereafter. The life of a lease is fixed at twenty years. Regulations further stipulate that the lessee shall pay a royalty of 2½ per cent of the value of the products of a location after it reaches $10,000. All persons obtaining leases must put at least one dredge to work promptly, and if a year passes without any work being done the lease is cancelled automatically.

Mexico City Letter

By W. L. Vail

Special Correspondent

Metal Mining Experiences But Little Inconvenience by Reason of So-Called Revolution

Mexico City, Jan. 26—There has been practically no change in the general mining situation because of the so-called revolutionary activities in various states of the republic. Whatever attempts may have been made to disturb the public order have been abortive. The Yaqui uprising in the State of Sonora has interfered with a few properties in the sections affected, not because of any interference with the mine owners but because of temporary suspensions of traffic and difficulties in securing permits to take explosives to the mines. Elsewhere mining operations appear to be practically unaffected, and if there is any real revolutionary sentiment throughout the interior, the public in general has not yet been made aware of it.

According to a bulletin of the American Chamber of Commerce, in this city, over one-half of the mining properties of Mexico belong to American interests. The most important company in the list, because of the extension of actual working properties and amount of money invested, is the American Smelting & Refining Co. The A. S. & R., with its numerous subsidiaries working throughout the country, easily takes the lead. The capital invested by this concern is placed at $35,000,000.

The second place is given the American Metals Co., of New York, with its numerous subsidiaries, including the Peñoles company, with an investment of $25,000,000, followed by the Phelps Dodge Corporation, having the Greene-Cananea, Moctezuma Copper Co. and other large properties, all productive and controlled by the Cole-Ryan interests. Their investments are placed at $10,000,000. The Bethlehem Steel Co. is mentioned as one of those concerns most heavily interested, and the sum total of American mining investments is placed at $300,000,000.

The directors of the Santa Gertrudis mines, Pachuca, in a bulletin to stockholders announce that 9 per cent dividend for the last three months of last year will be paid in a few days, and that in the future, because of the uncertain price of silver, dividends will be paid every six months, instead of quarterly, as heretofore. Even with silver at 52c. per ounce, the directors promise an annual dividend of not less than two shillings per share. Ore reserves, not including Fresnillo, are above 1,635,000 tons, containing 21,000 oz. of gold and 20,000,000 oz. of silver. It is also stated that during the year the directors purchased the Ohio and Ignomar properties in exchange for 50,000 shares of Santa Gertrudis.

Renewed Interest in Mercury

Because of the excellent price being obtained for mercury at present, there has been a revival in what was a very important mineral industry in Mexico prior to the introduction of the cyanide process of ore reduction. The Federal Department of Mines, in a bulletin issued a short time ago, prints an extensive list of recent denouncements of mineral claims carrying mercury ores. The same authority states that twenty-six "solicitudes" for exploitation of this class of ores have been made in the State of Guerrero alone within the past seven months. Bulletin No. 40 of the Mexico Geologic Institute publishes a comprehensive list of districts in Mexico where mercury ores are found in quantities. The list is confined principally to the states of Guerrero, which leads; Durango, Guanajuato, Zacatecas, Chihuahua, Hidalgo, Jafisco, Queretaro, and San Luis Potosi.

San Rafael Increases Production

Reports from the San Rafael workings, in the State of Hidalgo, show an increase of tonnage and bars shipped for the fourth quarter of last year, over the third quarter. During the last three months of the year just closed 57,318 tons was handled, against 51,734 the previous three months, and 31,088 kilos of silver were shipped, against 28,586 during the third quarter. According to report, conditions in general of the work at the San Rafael, in so far as operations in the State of Hidalgo are concerned, are favorable.

The proposed labor law, which has worried mine operators more than any other single factor, appears to be languishing. Both chambers of Congress have closed till next September, unless called in special session, and it is not generally believed that the measure will be discussed before the next regular session of Congress.

Alaska-Treadwell Plant Sold for Junk

The old Alaska-Treadwell mill and mining plant, Douglas Island, Alaska, is being dismantled and shipped to Seattle as junk. The SS. "Border Queen" recently arrived in Seattle with several hundred tons of scrap iron and steel from the property.

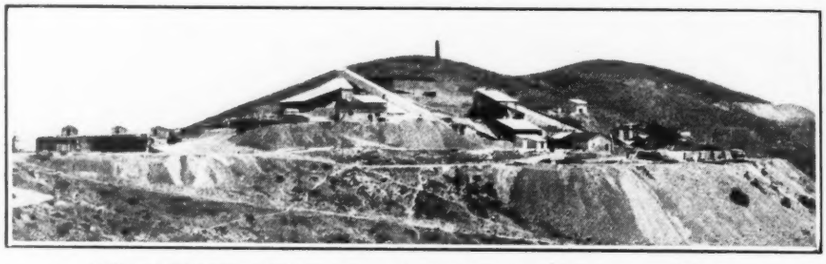
Kay Copper Reports Finding of Rich Ore

Reports are to the effect that an important strike of high-grade ore has been made on the 1,500 level of the Kay Copper Co., at Canyon, Ariz. The ore, where encountered, is said to be 26 ft. in width, and is also reported to have been disclosed on the 1,350, 1,200, and 800 levels of the mine. Plans are being drawn for the construction of a mill to treat the ore already blocked out.

Angustias, Dolores y Anexas Suspends—Santa Brigida Promising

Report comes from Pozos, Guanajuato, Mexico, that the mines of the Angustias, Dolores y Anexas Co. have suspended operation, because of the low price of silver. These mines have been operated since the early 80's, with a large silver production. With an increase in the price of silver, and the possible change from cyanide to flotation for low-grade sulphide ores, there may come another period of activity. Six or seven hundred men are thrown out of employment, and the suspension is vitally felt by the surrounding district. During the past four years these mines have been under the management of Jerome Hilbert.

Aside from the operations of the Angustias company, in the Pozos district, there is little activity. M. E. Miningham, however, has control of the Santa Brigida mine, a copper-lead-silver deposit, which has been an important producer, and its operation may bring life again to the Pozos district.



Mill of Pittsburgh-Veta Grande Mining Co., Zacatecas, Mexico

About 5,000 tons of ore has been shipped recently from the Santa Brigida dump to the smelter at San Luis Potosi, Mexico. The dump ore, though high in silver, with 2 per cent copper and 3 per cent lead, has to be concentrated by passing over buddles, to make a smelting grade. Later developments indicate that there is considerable high-grade ore in the mine, and that ore shipments will be resumed in the near future.

Estrella del Norte Shipping Small Lots

At the Estrella del Norte, 5½ hours from Magdalena station on the Southern Pacific, 2½ hours north of the Santiago River and 50 miles northwest of Guadalajara, in the State of Jalisco, Mexico, Dr. William I. Israel is working a number of men on a small high-grade vein. Shipments of small lots have been made to the Peñoles smelter.

The ore is ground by an arrastra, yielding 4½ kilos of silver and 20 grams of gold per metric ton. Silver occurs in part as antimonial silver sulphide.

Skilled Miners Scarce at Michigan Copper Mines

The mines of the Michigan copper district are plentifully supplied with unskilled labor, but additional miners could be used. Comparatively few experienced miners are coming in, but under the present system miners can be developed more rapidly than in previous years.

London Letter

By W. A. Doman
Special Correspondent

New Tin Companies Formed—Rhodesia Broken Hill Increases Capital

London, Jan. 18.—Base metals, chiefly tin and copper, form the main topic in mining circles at the moment. The tin market has disappointed many speculators, as the price of the metal has not gone forward as it was hoped and expected to do. There is always some consolation somewhere, however, and Nigerian producers are expected to benefit at the expense of Malayan. In the F.M.S. unparalleled floods have occurred, checking production, in many cases for some weeks. At the same time working costs per ton are likely to be higher, as the outlay in restoring the position has to be met. It had been thought in some quarters that Nigeria was fairly well prospected so far as tin deposits are concerned, but a new company, the Juga Valley Tin Areas, is just being floated with a capital of £175,000 in 5s. shares. The property is situated on the Bauchi plateau, and is reported upon by E. Seaborn Marks.

Another tin company soon to make an appeal to the public is the South West Africa Tin Corporation. This company is to acquire from former German holders several areas in what was German South West Africa. The properties are reported upon by Trewartha James, of the firm of James Brothers, who are also interested in gold-mining areas in Western Australia and Canada. Trewartha James went to South West Africa on behalf of the Ranga Tin Syndicate, and made a report upon the areas concerned, but so far nothing has come of it. At the time it was said that native labor was scarce, and water was available only at certain times of the year. As the new company to be formed is somewhere in the vicinity, it is supposed that both labor and water facilities are better than in the case of Ranga.

Tin mining in Cornwall is said to be looking up, and according to M. Taylor, of East Pool, it is many years since the prospects were so bright. Apparently everything hinges upon the maintenance of the present level of prices for tin and arsenic.

Rhodesia Broken Hill Development has increased its capital to £2,500,000 by the creation of 2,000,000 shares of 5s. each. Not all of these are to be issued now, but some hundreds of thousands have been applied for at a small premium. As bids for the shares have come from South Africa, it is presumed the financiers know what they are doing. Criticized as to the lack of dividends, and the big additions to the capital, Edmund Davis, the chairman, pointed out that the company's concession embraced an area of 35 square miles, that some valuable deposits had already been proved, and that the electrical prospecting process had indicated further important orebodies that did not outcrop. The business had expanded in a way not expected at the outset, and it was essential, said Mr. Davis, to operate on a large scale. The plant now being erected should be at work by the beginning of September next, unless something unforeseen happened.

The Indian Copper Corporation is about to raise additional capital, and the unissued preference shares are to be converted into ordinary shares.

Depression in Spanish Iron Mining

The iron mining industry of Spain, suffering under a cumulative burden of several adverse years, during which production has been severely curtailed because of decreasing foreign purchases, was particularly depressed at the end of 1926, states a report to the U. S. Department of Commerce.

A number of causes have contributed to the crisis in this old industry of Vizcaya. The more outstanding may be enumerated as (1) decrease in the consumption of iron ore in Great Britain; (2) widespread use of scrap in the manufacture of steel; (3) competition of African (Algerian and Moroccan) and Swedish iron ore; (4) shortening of the local working day and increases in wages; (5) increased mining taxes; (6) division of the mines which increases the costs of exploitation; (7) decrease in production due to the exhaustion of surface deposits; (8) increased consumption in the European blast furnaces of the cheaper, high-phosphorus iron ore (the greater part of the Vizcayan ores are not phosphoric); (9) increase in freight rates, combined with lowered rates from such sources as Algeria and Morocco.

The statistics of production also reflect this influence, as the approximate production of the mines in 1926 was only 1,230,000 tons, as compared with 3,054,321 tons in 1913.

Heavy Equipment for Red Lake Area

Much heavy equipment is being taken into the Red Lake area of northern Ontario, over the winter roads, to several of the properties of the camp, in preparation for active development work in the spring. The equipment of the Howey mine now going forward includes an 800-ft. Ingersoll-Rand compressor, a hoist good for a depth of 1,000 ft., two boilers of 80 hp. each, and supplies for a large crew. Plans have been made to sink the shaft to cut the orebody at 500 ft.

The company is looking to the Manitoba Power Co. as a source of power. The latter is under contract to furnish a supply to the Central Manitoba Mines, and an extension of its line from Bulldog Lake to Red Lake may be found available. At the Jackson-Manion property, at Woman Lake, under option to the Hollinger interests, three diamond drills are being brought in to be ready for the summer work. Active preparations for development are also being made at the Bathurst, Dunkin, and Smith properties, in the immediate vicinity.

Johannesburg Letter

By John Watson
Special Correspondent

Decline of Native Labor—Interest Remains in Diamonds and Platinum

Johannesburg, Dec. 28.—The quarterly meeting of the Transvaal Chamber of Mines was held in Johannesburg on Dec. 20. Douglas Christopherson, vice-president, presided and showed that there is a serious diminution of native labor on the gold mines, the figure having fallen from 185,000 to 176,602. The alluvial diamond diggings now employ about 55,000 natives.

Carrig Diamonds, Ltd., was floated recently to acquire a portion of Grasfontein farm. Within five weeks of its registration, a dividend of 50 per cent was declared; a fortnight later, a second dividend of 50 per cent has been declared. The company has 200 claims in all.

At the Johannesburg Rotary Club, on Dec. 21, Dr. Hans Pirow, the recently appointed Government Mining Engineer, was the guest of honor. Dr. Pirow gave an address on "Safety First" in the mines and paid a glowing tribute to the services rendered by his predecessor, Sir Robert Kotze, who had reduced the accident rate in mines by about one-half.

Platinum Report Issued

Potgietersrust Platinums, Ltd., issued, on Dec. 22, reports of the directors, technical committee, and manager. This company now has a capital of £1,500,000 and properties comprising four farms totaling over 7,000 morgen, (1 morgen = 2.11 acres), with other mineral and prospecting rights over 113,721 morgen in the Rustenburg district and over 60,000 morgen in the Potgietersrust district.

On the Johannesburg Stock Exchange, during the last week, business has been intermittently active. Sub-Nigels have again been in demand, both for London and local buyers. Their price has improved from 69s. 3d. to 79s. Modder East shares were also in demand; they have improved from 21s. 6d. to 22s. 7½d. and the debentures have risen from £108 to £112 during the week. Potgietersrust platinums have fallen from 8s. 2d. to 7s. 10½d.

Tuberculosis Investigation

The executive committee of the local Chamber of Mines has considered the medical committee's suggestions for a systematic investigation into the incidence and spread of tuberculosis in the native territories and has agreed to subscribe £2,000 per annum for a period of three years in support of the proposed survey. Two other committees are subscribing the same amount. The Gold Producers Committee has provided for the radioscopic examination annually at the W.N.L.A. compound of all natives of over six years' service on one mine. All such natives are also to be stethoscopically examined annually and, in the case of suspect cases, quarterly.

Societies, Addresses, and Reports

Winchell Library a Gift to the United Engineering Societies

The memorial gift of the library of the late Horace Vaughn Winchell to the United Engineering Societies Library, that has been offered by Mrs. Winchell and the Anaconda Copper Mining Co. through the American Institute of Mining and Metallurgical Engineers, was accepted for that purpose by the board of directors of the Institute at its meeting on Jan. 28. Dr. H. Foster Bain, Secretary of the Institute, in informing the Anaconda company of the action taken and the sentiments of the board on learning of the gift, expressed "special delight that this important collection of books is to be kept together and made generally useful for all time through the generosity of the company on whose staff Winchell so long served. It seems a very fine tribute by a corporation to the good work done by an engineer, and as such the Institute will value the act and the gift especially."

The career of the man to whom this fine tribute will be made began in study under his eminent father, N. H. Winchell, and uncle, Alexander N. Winchell. He graduated from the University of Michigan in 1889, and after several years' study of ore deposits, he became geologist in charge of the geological department of the Anaconda Copper Mining Co. and allied companies for eight years. His development of this department is one of his greatest contributions to the mining industry. He was in charge of the geological department of the Great Northern Railway Co. for two years, since when he had been engaged in private consulting and mine examination in all parts of the world. He was an expert on mining litigation, especially the apex law. During 1919 he was president of the American Institute of Mining and Metallurgical Engineers.

THE WINCHELL LIBRARY

This magnificent special collection of 10,000 books is the accumulated working tools of three leaders in American science and technology. Horace V. Winchell was an ardent lover of books as well as a keen geologist. The library that has come into possession of the Institute includes the books covering early American geology, collected by his uncle and his father, and his own extensive collections dealing especially with ore deposits, mining law, and the history of geology. His interest in mining litigation and his proposed revision of the mining law led to his assembling what is doubtless the most complete library on the apex law that has been brought together. He had assembled most of the documents needed to make a translation of Agricola when he heard that Mr. and Mrs. Hoover were working on the same project and dropped it. But from then on he sought and purchased old and rare books dealing with mining and geology.

The United Engineering Societies Library, which is the largest and most complete engineering library in America and one of the foremost engineering libraries of the world, is to be the custodian of this remarkable gift collection. Through the generosity of Mr. Winchell's widow and the Anaconda company, which he served so long with such distinction, these books will be placed at the service of all men in the profession.

Mechanical Engineers Plan Spring Meetings

Plans are under way for the White Sulphur Springs meeting of the American Society of Mechanical Engineers, May 23-26. A large entertainment committee under the leadership of William L. Batt, member of the standing committee on meetings and program, is at work planning the events that will crowd the four days of the meeting with pleasure for those attending. The professional divisions are making vigorous attempts to secure a list of outstanding papers for presentation at this meeting. A regional meeting will be held at Kansas City April 4, 5, and 6. The Kansas City Section, under the leadership of F. S. Dewey, is outlining an interesting program of entertainment and excursions.

On account of a year's work on the part of the Oil Power National Conference steering committee, Oil Power Week, scheduled for April 18-23, 1927, promises to assume more importance than in previous years.

Metropolitan Section Will Promote Engineering Education

At an organization meeting, held Jan. 22, of members of the Society for the Promotion of Engineering Education living in the metropolitan area of New York City, the formation of a section of the society to be known as the New York and Northern New Jersey Section was made an accomplished fact. Dean George B. Pegram, of Columbia University, was elected president, and Dean E. H. Rockwell, of Rutgers, secretary. At the invitation of Dean A. M. Greene, the next meeting is to be held at Princeton.

The Institute of Metals Meets in London

At the annual meeting of the Institute of Metals, to be held in London on March 9 and 10, seventeen papers are to be submitted. In the evening of March 9 the annual dinner of the Institute will take place at the Trocadero Restaurant. Following the dinner a dance will be held. This dinner-dance is the first function of the kind to be arranged by the Institute.

Engineers' Club of Northern Minnesota to Dine Feb. 26

The Engineers' Club of Northern Minnesota, made up of prominent mining men of the Cuyuna, Mesabi, and Vermilion iron ranges, will hold its thirteenth annual banquet at Chisholm this year on Feb. 26.

Engineering Museum Elects Officers

The board of trustees of the National Museum of Engineering and Industry announces the election of new officers and a new program as the result of a meeting held in the New York headquarters of the American Institute of Electrical Engineers on Jan. 20. Up to this time efforts have been concentrated on a program to raise endowment funds. Hereafter efforts will be concentrated on holding together and increasing the membership until it is determined whether the fund-raising activities can be resumed with good augury. It was agreed that commendable progress had already been made, but that even so meritorious a movement as the establishing of a national museum of engineering and industry cannot succeed without the enthusiastic co-operation of the four founder societies.

Thomas Ewing, former Commissioner of Patents, was elected to the presidency of the trustees. Edward G. Acheson, L. H. Baekeland, Charles F. Brush, Thomas A. Edison, Frank J. Sprague, Edward Weston and Orville Wright were elected vice-presidents; H. F. J. Porter was made consulting secretary; Harrison W. Craver, secretary; and George E. Roberts treasurer.

British Columbia Mine Operators Dine Legislators

The Mining Association of British Columbia, a body representative of the chief mine operators of the province, entertained the Hon. R. R. Bruce, Lieutenant Governor, members of the Cabinet and the Legislature, and prominent citizens at a dinner at the Union Club, Victoria, on Jan. 12. The chief object of the dinner, which is to be an annual affair, was to discuss the several needs of the mining industry with the legislators. The principal speakers were the Hon. R. R. Bruce, Lieutenant Governor; the Hon. John Oliver, Premier; the Hon. A. M. Manson, Attorney General; the Hon. W. H. Sutherland, Minister of Public Works; H. M. Lamb, secretary of the association; and C. A. Banks. All the speakers were enthusiastic about the progress made by the industry in 1926 and the outlook for 1927.

B. C. Chamber of Mines Elect Officers

The British Columbia Chamber of Mines held its annual general meeting at Vancouver on Jan. 11, when the following officers were elected: F. E. Woodside, president; H. P. McCraney and G. E. Eldridge, vice-presidents; Harry Browning, secretary; W. Mason-Rooke, treasurer; and C. N. Beebe, W. E. Bland, C. B. Cave, J. F. Crossland, N. W. Emmens, A. C. Garde, W. Godfrey, R. R. Hedley, T. Kirkpatrick, B. F. Lundy, M. Moore, R. C. Sweatt, Nichol Thompson, A. M. Whiteside, and A. S. Williamson, executive committee.

People You Should Know About

A. W. Allen is in New York.

George J. Young has returned to San Francisco.

H. W. Turner is examining a gold mine in Sonora, Mexico.

H. C. Enos, consulting engineer, of Los Angeles, recently visited Utah mines and Salt Lake City metallurgical plants.

L. S. Cates, general manager and vice-president of the Utah Copper Co., spent a part of January in Washington and New York on business.

James MacNaughton, of Calumet, Mich., president of Calumet & Hecla Consolidated Copper Co., has returned from a business trip to Boston.

W. Mont Ferry, president of the American Silver Producers' Association, has returned to Salt Lake City from a business trip to Chicago.

J. C. Houston, consulting engineer, has gone to the Corona property in the Rouyn area of Quebec to investigate the recently reported discovery.

Maurice J. Eisenberg, president of the Butte Hill Copper Mining Co., and two of the largest stockholders of that company are inspecting their properties in Butte.

Gibson Berry, superintendent for the Round Mountain Mining Co., at Round Mountain, Nev., has returned to the mine from a visit of several weeks in San Francisco.

Edgar L. Newhouse, Jr., representative of the American Smelting & Refining Co., spent several days during January in Salt Lake City inspecting Utah operations.

Frederick Burbidge, of Wallace, Idaho, general manager of the Federal Mining & Smelting Co., is in the Tri-State zinc field, where the company is engaged in extensive operations.

A. L. Beekly, of the Mid-Continent Petroleum Corporation, has been elected president of the Tulsa Geological Society for 1927, succeeding **A. F. Truex,** chief geologist for the Twin State Oil Co.

Dudley J. Inskipp has been in the Transvaal during the last few months on a professional inspection of certain mining districts. He left Johannesburg on Dec. 21 for Bulawayo, on his return to Rhodesia.

L. C. Penhoel, president of the Southwestern Engineering Corporation, of Los Angeles, will make his headquarters in New York for the next few months. The company's branch office in New Work will be reorganized.

Charles L. Harrington is devoting his entire time to his engineering business in Idaho Springs, Colo., after two years as manager of the U. S. Vanadium Co. mine at Rifle, Colo. The mine was recently sold to the Union Carbide & Carbon Corporation.

Thomas F. Cole, for some years president of the Seneca Copper Mining Co., as resigned. **C. W. Newton,** who has been connected with mining developments in the Coeur d'Alene district, has been appointed vice-president in charge of operations.

H. DeWitt Smith, formerly general superintendent of the United Verde Copper Co. mines at Jerome, Ariz., and for the last two years associated with the New York Trust Co.'s industrial department, has been appointed assistant managing director of the United Verde Copper Co., with headquarters at 111 Broadway, New York City.

J. Volney Lewis

Prof. J. Volney Lewis, of Rutgers University, head of the department of geology, has been granted a six months' leave of absence to conduct geological research in South America.

R. V. Norris was the guest of honor at a dinner given on Jan. 27 at the Union League Club, New York, by Walter H. Aldridge, in behalf of Mr. Norris's many friends on the directorate of the A.I.M.E. and others, and in recognition of his long service as a director. A silver loving flagon was presented to Mr. Norris.

S. N. Graham, professor of mining at Queen's University, Kingston, has been appointed correspondent in Canada for the Anglo-French Exploration Co., in place of **J. B. Tyrrell,** whose agreement terminated Dec. 31 last. It is understood that Mr. Graham will continue his university work and will devote his summers to field work for the Anglo-French.

Andrew C. Lawson, professor of geology in the University of California, has returned to his duties after travels that have taken him over 50,000 miles, including a journey up the Nile to Uganda, thence to Mombasa, on the east coast of Africa, and from there up the Red Sea to Suez. He attended the International Geological Congress at Madrid last May, and at that time visited Morocco, where he saw some of the fighting between Spanish troops and the people of the Riff. Later he went down the west coast of Africa to Walfish Bay, from there across South West Africa to Kimberley, where he had an enjoyable visit with Alpheus Williams, the general manager for the De Beers Consolidated. From the diamond center he went to Johannesburg, then northward through Bulawayo to the Victoria Falls, on the Zambesi, and to some of the mines of Northern Rhodesia. On his return homeward be attended, in his capacity as an expert witness, the trial of an important mining suit at Butte, Mont.

Obituary

James Allan Fraser, who for twenty-two years was gold commissioner at Atlin, B. C., died at his home in Vancouver on Jan. 5. Mr. Fraser will be remembered by many who participated in the famous Klondike gold rush.

Prof. Edwin Theodore Dumble, of Houston, Tex. and Old Church, Va., died on Jan. 27 in Nice, France, at the age of seventy-four. Professor Dumble organized the Geological Survey of Texas and was State Geologist from 1887 to 1896.

John Farquhar Cowie, formerly secretary of the Association of Mines (South Africa), and, later, secretary of the Transvaal Chamber of Mines, from 1903 to 1911, died on Dec. 6, at The Hague, Holland. He was born in Scotland in 1860 and went to Johannesburg in 1891. Mr. Cowie had a son who was killed in the great war while serving as a medical officer. He leaves a widow and a daughter, resident in England.

Thomas Connors, managing director of the T. Connors Diamond Drilling Co., died at Kimberley, B. C., after a brief illness on Jan. 15. Mr. Connors and his partners have done the diamond-drilling work for the Consolidated Mining & Smelting Co. of Canada for many years. During last year, Mr. Connors and his associates, backed by the Consolidated company, formed the Diamond Drilling Co., to undertake general custom contract work.

J. P. Couldrey, long associated with mining development in Australia, having since 1896 been identified with many prospecting enterprises in that country and in the copper region of Arizona, was killed by a fall of earth at the Burrowye tin mine, at Burrowye, Victoria, Australia, on Oct. 18 last. During the war Mr. Couldrey was attached to the Tunneling Corps. Though twice gassed, he returned to Australia, and had latterly been prospecting in the Upper Murray River district. He leaves a widow and a son.

John L. Harris, former manager for the Quincy Mining Co., died recently at his home in Hancock, Mich., at the age of fifty-nine years. He was a member of the first class to be graduated from the Michigan College of Mines and later attended Massachusetts Institute of Technology. For a few years he was an instructor at M. C. M., but gave up this work to become assistant to his father, Samuel B. Harris, who was at that time the manager of the Quincy. The younger Harris later became the Quincy manager and resigned to take charge of Hancock Consolidated. When the latter property was abandoned Mr. Harris became interested in the development of lead properties in Missouri. He never married.

Recent Technical Publications

Reviews, Abstracts, and References

A Geological Guide to Central Chile

The Geology and Metal Deposits of Chile. By J. M. Little. The Branwell Co., New York. Price $5.

The title of the book is somewhat misleading, since the study covers only the ore deposits and geology of three of the central provinces of Chile. The author in his preface admits this limitation, but adds that the general characteristics of the geology and ore deposits discussed apply to the whole of Chile. The reviewer cannot agree with this statement. Chile covers a length equivalent to the distance from Butte to Panama; the provinces of Atacama, Coquimbo, and Aconcagua, hardly that of Salt Lake to Bisbee. With the utmost allowances for greater simplicity of Andean geology, such a generalization is inadmissible.

The geologic map of these three provinces, which accompanies the text, has the unfinished and sketchy appearance of notebook memoranda, but, after all, the data will be welcomed by the engineer, who so far has had no geologic maps at all to guide him. In spite of its artistic shortcomings it is the most valuable part of the book.

The text is divided into four chapters. Chapter I deals with the topography, climate, and general geology. In his table of rock formations the author exhumes the pre-Victorian geologic time scale. Few will know what is meant by Primary Age and Secondary Age, accustomed as we are to such terms as Pre-Cambrian, Paleozoic, and Mesozoic.

Chapter II treats of the ore deposits. The author presents a classification based on relative deposition temperatures, that is, an approach to a classification on zonal lines. In this scheme ore deposits of a number of different metals may fall in one group, and, on the other hand, copper ranges between two groups. This latter metal, which in Chile is the most interesting, is assigned to a high-temperature group when the ore consists largely of cupriferous pyrite, hematite, and quartz; and to a lower temperature division when it is made up of bornite and rich chalcopyrite, with calcite as the principal gangue mineral. This subdivision of the copper deposits based on deposition temperatures and the economic deductions that the author draws therefrom are interesting and may have some valuable element of truth. The criteria suggested, however, are not convincing. Only in some of the smaller deposits is calcite a principal gangue mineral. Bornite, on the other hand, occurs with quartz above low-grade chalcopyrite in many mines. The author summarily dismisses bornite as a possible secondary mineral. Likewise, in the silver deposits only argentite is considered secondary; proustite and pyrargyrite are held to be primary. In a classification based upon such controversial points much will depend upon the observer, and the personal equation looms up to an extent that would satisfy a musical critic.

Chapter III is devoted to brief descriptions of 242 ore occurrences listed by the author, each of which is placed in its proper pigeonhole in the classification scheme. Ninety per cent of these mines are of slight importance and perhaps even a greater percentage of them are lying idle at present. An American would naturally expect in a book with the title of this one, a description of the geology of such important producers as the Tofo iron mine, Chuquicamata, and Teniente (Braden); but the geology of the first is covered in a brief paragraph; likewise Chuquicamata, the world's greatest copper mine. Teniente fares somewhat better, but nothing is said about other districts like Collahuasi, Tocopilla, Gatico, Las Condes, Catemu, and Naltagua, which are the only other important producers in Chile at present.

Chapter IV, under the heading Economic Aspects, gives some statistics of the year 1916 and of 1923. In a general way leaching, concentrating, and smelting ores are taken up and the favorable and unfavorable factors are set forth in each case. This is the last chapter of the book, which upon closing leaves one with an impression of great leniency on the part of the proofreader.

It must be admitted that the book hardly comes up to the expectations that the capabilities of the author as a seasoned geologist have aroused in those of us who know him and his work. Nevertheless, it should be very useful to anyone interested in the mines of central Chile. To the scout and examining engineer, the data it furnishes on individual occurrences, and more especially the geologic map, will prove a valuable starting point. It would have been even more valuable fifteen years ago, for since that time droves of scouts have gone over Chile with a fine-toothed comb. F. R. KOEBERLIN.

German Mineralogical Terms—German mineralogical terms often prove stumbling blocks to the English reader. A glossary of the principal ones is being published in *The Mining Magazine* (London; price 1s. per copy), beginning with the November issue. Aubrey E. Horn is the author.

Bureau of Standards — The Annual Report of the U. S. Bureau of Standards for the fiscal year ended June 30, 1926, was recently issued, and may be obtained for 5c. from the Superintendent of Documents, Washington, D. C. Among other things, work has been done on the Newtonian constant of gravitation, which, like the speed of light and Planck's constant of action, is one of the fundamentally important constants of nature. The accepted value of this constant is 6.66 by 10^{-8} $cm^3/gm.\ sec.^2$, but it now appears that 6.653 is more accurate than 6.66.

Canadian Mineral Resources — "Investigations of Mineral Resources and the Mining Industry, 1925," Bulletin No. 669 of the Mines Branch, Department of Mines, Ottawa, Ont., contains papers on the following subjects: "Hot Springs in Western Canada—Their Radioactive and Chemical Properties," pp. 33, by R. T. Elworthy; "Natural Gas in New Brunswick," pp. 5, by R. T. Elworthy; "The Building and Ornamental Stone Trade in Great Britain," pp. 22, by W. A. Parks; "Notes on Zinc and Lead in Eastern Canada," pp. 10, by A. H. A. Robinson; "Lithium Bearing Minerals in Canada," pp. 8, by L. H. Cole and V. L. Eardley-Wilmot; and "The Present Status of the Abrasive Industry," pp. 9, by V. L. Eardley-Wilmot. Copies are obtainable on request.

Flotation of Oxidized Ore — *The Southwestern Bulletin* has for some time been printing an excellent series of articles on flotation work. In the October issue is the first installment of one by Robert Lord on the beneficiation of oxidized ores by this process, with special reference to gold and silver ores. Copies may be obtained on request from the Southwestern Engineering Corporation, 1221 Hollingsworth Building, Los Angeles.

Deep-hole Prospecting—W. F. Netzeband recently contributed a 7-page paper to the A.I.M.E. on "Underground Deep-hole Prospecting at the Eagle-Picher Mines." The equipment used was similar to that employed at the Chief Consolidated in Utah. It is described, and the cost of the work discussed, this amounting to $2.12 a foot. Copies are obtainable from the American Institute of Mining Engineers, 29 West 39th St., New York City, for 25c. each.

Mine Drainage—U. S. Bureau of Mines *Reports of Investigations*, Serial No. 2,779, pp. 5, obtainable on request from the Bureau at Washington, D. C., discusses "Stream Measurement in Relation to Mine Drainage." The authors are W. R. Crane and E. J. Maust. The bulletin describes a study of mine drainage in the red iron-ore mines of the Birmingham district of Alabama. Gaging rods were generally used in measuring streams, and weirs in ditches sometimes as a check. These tests were in turn checked by current meter tests.

Natural Sodium Sulphate — The Mines Branch of the Canadian Department of Mines, Ottawa, recently published a comprehensive monograph on "Sodium Sulphate in Western Canada," by L. Heber Cole, discussing the occurrence, uses, and technology of these deposits. Many of the Canadian deposits are described in detail, and the book also contains much of interest to others than Canadians who may be interested in the utilization of "alkali lakes." Copies are obtainable from the Mines Branch at 40c. each.

Bolivian Tin—Thomas Giove has published a description of a treatment process for Bolivian tin ores—"Relaves y Minerales Estañiferous Complejos de Bolivia"—which pamphlet is published by Empresa Editora Alwatan, 557, 21 de Mayo, Santiago, Chile.

New Machinery and Inventions

1,000 lb. metal-melting pot equipped with three 5-kw. cast-in, sheath wire-immersion units

1,000-Lb. Melting Pot Introduced

A new metal-melting pot, with a capacity of approximately 1,000 lb., has been added to the General Electric line and is now on the market. This pot, utilizing the electric heating principle, is practically the same as other standard pots made by the company except that three cast-in, sheath-wire immersion heating units are used instead of two.

Each heating unit is rated 5 kw. The pot may be operated either in 110- or 220-volt, a.c. or d.c. circuits, and the use of three heating units will also permit balanced three-phase operation.

The pot itself consists of a sheet-steel cylindrical casing in which is supported a cast-iron crucible of the following dimensions: Inside, 18 in. in diameter and 15 in. in depth; outside, 29 in. in diameter and 31 in. in depth. The space between the casing and the crucible, measuring about 3 in., is efficiently insulated with a compact heat insulator. The leads of the heating units are brought over the top of the pot into a connection box fixed to the unit itself.

Melting pots of this type are designed for melting lead, babbitt, tin, solder, and similar alloys or metals, except spelter or zinc, at temperatures not exceeding 850 deg.

The maker recommends full automatic control, consisting of a standard automatic panel and a temperature-control instrument equipped with a special bulb for metal immersion. Separate heating units may be installed in existing installations of melting pots where dimensions permit and where temperatures do not exceed 850 deg. F.

Rail Bonds Facilitate Welding

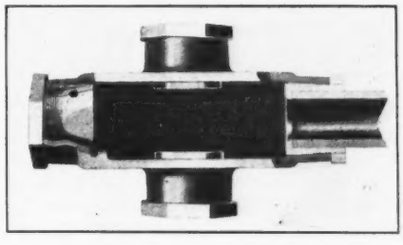
Two new rail bonds for application to the base of the rail by arc welding have been developed by the American Steel & Wire Co., Chicago, Ill. They are known as type AF-5 and Arcon "F" rail bonds. The AF-5 rail bond consists of a single copper strand welded into a drop-forged steel terminal. It is claimed that an improved design of terminal sleeve construction considerably lengthens the life of the bond.

A heavy steel hook which is integral with the steel in the terminal provides a means of holding and positioning the bond during welding. This hook is so designed as to easily fit between the rail and tie. The wide welding angle of the bond terminal is well suited for metallic-arc welding and a homogeneous steel to steel weld is easily accomplished even by an inexperienced operator. This new design of bond affords a low-resistance connection, with a minimum amount of time and welding material.

The Arcon "F" is a long flexible rail bond for application to the rail base around the splice bar. The steel terminal is designed to co-act with the top of the rail flange to retain the welding metal. Complete fusion between the strand ends and the rail base is accomplished, it is claimed, with a minimum expenditure of welding electrode. All unnecessary retaining walls have been eliminated so as to permit easy penetration by the welding arc, at a current of approximately 165 amp. A heavy hook is provided to hold the bond in place preparatory to welding.

New Box Saves Labor in Conduit Erection

Threading of conduit, a tedious and costly operation, is eliminated on a job where the new Kondu-Box fittings, of the Erie Malleable Iron Co., Erie, Pa., are used. The accompanying illustration of a type XB fitting with ends cut away shows the construction.



Details of conduit box

A wrench, hacksaw and reamer are the only tools necessary in installing conduit with these fittings. The conduit is not threaded but is held securely by a steel bushing having sharp concentric rings on the inside.

A slotted and tapered steel bushing with sharp concentric rings on the inside is pulled into position by a lock nut. The sharp rings of the bushing cut through the enamel and into the metal forming the necessary continuous ground connection and holding the conduit securely.

The fittings are made of malleable iron and therefore are practically unbreakable. The manufacturer claims this grip on the conduit stands 50 per cent more tensile stress than does a threaded fitting. Another distinct advantage of the Kondu-Box fitting is that every joint is virtually a union. Any sort of bend and any desired type of fitting can be inserted without recourse to unions or running threads.

Other merits claimed for the design are that the openings are large and unobstructed, that the cover-screw lugs are so located that it is impossible to cause a ground or short circuit, and that the cover screws are so arranged that they cannot loosen from the cover. The lack of exposed threads next to the fitting adds life and strength to an installation.

Whistle Operated by Solenoid

A steam signal whistle in the yard of a large oil refinery in the West is used to summon certain employees to the telephone. Each person so summoned has an individual code of long and short blasts. Although of the steam type, it is controlled by electricity.

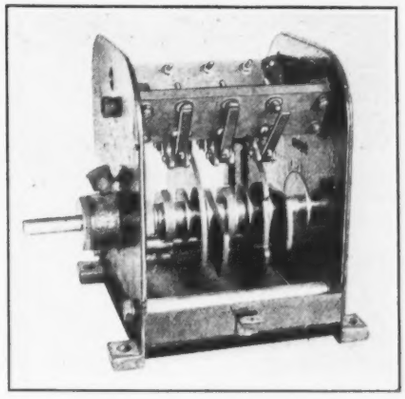
The impulses which govern the whistle originate in a small telephone-type switchboard with numerous jacks and one plug furnished by the Autocall Co. of Shelby, Ohio. The switchboard, with its code mechanism, is connected to the solenoid of a magnetic switch, the contactors of which close a circuit which energizes a solenoid-operated valve. As originally used the whistle valve was operated by a home-made solenoid device which required approximately 20 kw., whereas the present equipment consists of a balanced valve requiring less than a fifth of a kilowatt to operate.

The steam pressure used is about 100 lb. and the short blasts are sounded at the rate of four in five seconds. It is estimated that the valve has operated approximately 1,400,000 times since it was installed in July, 1924. Recently a duplicate outfit was installed by the same refinery.

Switches for Automatic Control

Rotating-cam limit switches to be used with magnetic controllers for the automatic regulation of machines having such fixed sequence of operation as slowing down, stopping and reversing, have been announced by the Electric Controller & Manufacturing Co., Cleveland, Ohio.

This cam-type limit switch is totally inclosed, is equipped with tapered roller bearings and is designed to carry



A new cam-type limit switch

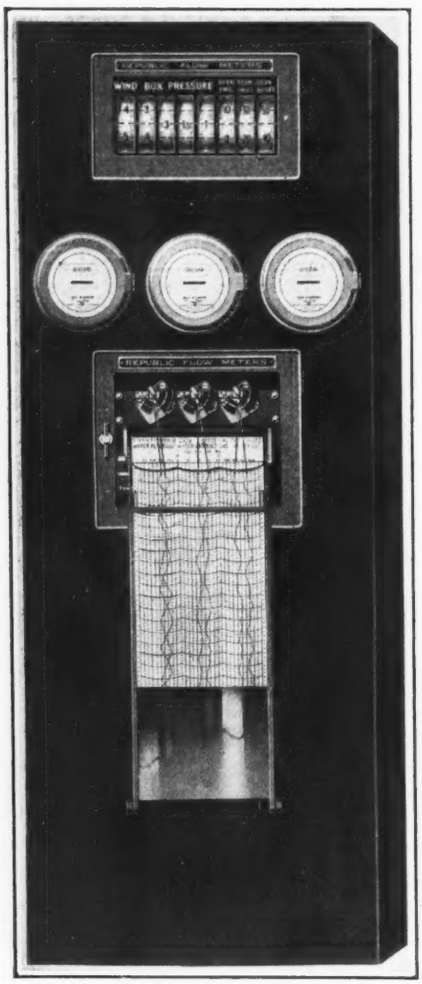
This device governs the retardation, stopping and reversing of automatic machines according, it is claimed, to any predetermined cycle. The instrument when in operation is totally inclosed.

up to six sets of contacts. The cams which operate the opening and closing of the contacts are each adjusted independently of the others and can be fixed at an infinite number of positions, thus giving extreme flexibility to the machine with which it is used.

Novel Meter Panel Quickly Shows Up Boiler Losses

A new boiler meter panel brought out by the Republic Flow Meters Co. contains a graphic boiler meter in which provision has been made for six electric recording elements exactly the same as have been used in the company's flow-meter recorders. These elements record on one 12-in. chart of the strip type which affords uniform time values at all points of the scale and permits ready comparison of records, since the time arc maintains the same position relative to the eye. The chart is driven by an electric clock at a normal rate of travel of one inch per hour. According to *Power*, the entire day's record is visible at all times, giving one shift the opportunity to compare results with another.

From the illustration it will be seen that the boiler meter chart is divided into three zones, giving, in effect, three distinct charts, all synchronized and having the advantage of continuous juxtaposition for ready comparison. In each zone it has been found almost impossible to combine more than two records without endangering the value of the records through interweaving.



Meter makes comparisons easy

Being a recording as well as indicating device the record of the previous shift is in full view of the working shift. They may thus maintain or better this record if possible.

In the operation of any boiler, there are two factors of paramount importance, such as the rate of heat absorption, or the work done by the boiler, and the rate of heat loss. The steam-flow graph is a positive record of the heat absorption. Although the heat loss in the boiler is really a combination of various losses, it so happens that the stack loss is the major item subject to the widest variation, so that a record of the CO_2 content and the temperature of the waste gases may be taken as a satisfactory operating index of the total boiler losses and of the boiler efficiency. Therefore, both the CO_2 and the stack temperature are charted so that the two records may be observed simultaneously and in conjunction with the steam flow.

Besides these three records the choice of auxiliary records desirable will be determined by the character of the steam generating equipment. If economizers are used, the flue-gas temperatures entering and leaving are useful, as well as the water temperature leaving the economizer. With air preheaters a knowledge of the temperature of the inlet and outlet air is necessary in working out the date of the boiler-room heat balance.

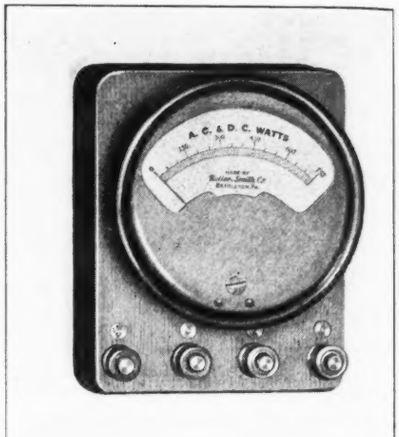
In addition to the graphic records outlined for the boiler meter chart, there are certain conditions of operation, such as drafts, best shown by an indicating instrument. These instruments are all embodied in one case, known as the Republic draft indicator, which, with the integrating instruments necessary for the calculation and logging of results, is mounted along with the graphic boiler meter, so that the one panel affords a complete survey of the boiler operation.

Portable Meters Are Available for Wide Range of Uses

To meet the demand for a small and inexpensive portable measuring instrument made necessary by the increasing use of alternating current, the Roller-Smith Co., 233 Broadway, N. Y., has announced its Types HTA and HA wattmeters for single-phase alternating current and direct current.

These instruments are suitable for testing alternating current motors and generators, light and power circuits, small appliances, etc. The types HTA and HA comprise ammeters up to and including 50 amp., voltmeters as high as 300 volts, and direct-current and single-phase wattmeters with maximum capacities of 30 amp. and 300 volts. The company claims that these ammeters and wattmeters can be used for higher currents by means of 5 amp. capacity instruments with external current transformers having suitable ranges of transformation.

In order to combine in one instrument the ranges of several individual ones, voltmeters are supplied with double and triple ranges and wattmeters with double voltage capacity when wanted. The manufacturer states that all these instruments are designed so that they may be used on direct-current circuits with good accuracy, this being particularly true of the ammeters, wattmeters and voltmeters of 150 volts and over.



Instrument can be carried in pocket

These types of measuring instruments cover a wide range in current and voltage capacities for either direct or alternating current. They are light and compact.

Catalogs

Muffles—The Denver Fire Clay Co., Denver, Colo., has issued a leaflet describing "Carbofrax (silicon carbide) muffles.

Pipe—Naylor Spiral Pipe Co., 1230 East 92nd St., Chicago, Ill., has ready a catalog on its spiral lock-seam pipe. This is a light-weight pipe with a smooth inside.

Track—Mine and industrial track equipment are described by The Bethlehem Steel Corporation, Bethlehem, Pa., in a 160-page illustrated catalog (K).

Electric Furnace—Bulletin 276, W. S. Rockwell Co., 50 Church St., New York, describes an electric furnace of the revolving retort type intended for heat-treatment of metal parts.

Oil Burning—The Anthony Company, Long Island City, N. Y., describes The Anthony "Nebulyte" oil-burning system (of gas firing with oil fuel) in an eight-page catalog.

Surveying Instruments—The Warren-Knight Co., 136 N. 12th St., Philadelphia, Pa., has issued several pamphlets describing its transits, levels, and other instruments.

Dynamometers—General Electric Co., Schenectady, N. Y., has issued Catalog GEA-544, describing the company's dynamometers; four pages.

Compressors—General Electric Co., Schenectady, N. Y. Small multi-stage centrifugal air compressors. Catalog GEA-528; four pages.

Turbines—General Electric Co., Schenectady, N. Y. Mechanical drive turbines. Catalog GEA-578; eight pages.

Market and Financial News

Howe Sound Earnings Increase

Annual Profits Higher—Fourth Quarter Shows Decline in Output and Income

ALTHOUGH the fourth quarter showed a decline of $200,000 in earnings compared with the third quarter, the results of the year 1926 for the Howe Sound Co. showed a big improvement over those of the preceding year. The company operates the Britannia copper mine, in British Columbia, and the El Potosi and Calera lead-zinc-silver properties, in the State of Chihuahua, in Mexico. The lower prices for metals in the last quarter militated against sustained earnings.

Comparative results for the two quarters are shown in the accompanying table.

The company hopes to have the new addition to the mill at Chihuahua in operation about Feb. 1 and will then be treating about 1,000 tons of milling ore, compared with 700 tons a day as at present. This should offset any drop in earnings due to recent declines in metal prices.

The management sees nothing in sight to interfere in any way with operations south of the border, and as the company has been able to operate continuously throughout the whole revolutionary period, with the exception of two weeks in 1916 when the mine ran short of coal, it expects to keep up its record of continuous operation despite the controversy with Mexico.

The company is developing at its Britannia mine, in British Columbia, as well as at Calera and El Potosi, and with quite satisfactory results at all three properties.

The 2,500 level of the Victoria mine, at Britannia, the deepest in the property, is said to be developing most encouragingly, with the orebodies, both in grade and in size, fully as good as upon the 2,350 level immediately above, which was the richest in the mine prior to opening the 2,500 level. The company expects to sink the shaft another 150 ft. and begin to develop the 2,650 level at the Victoria.

Work on the 2,700-ft. tunnel is progressing rapidly, and it is expected to hole into the Bluff West workings in the spring, probably in May. This tunnel is to be the new working level for operating and developing the west end of the ore zone at Britannia below the 2,200 level.

The preliminary statement for 1926, compares with the corresponding figures for 1925 as follows:

	1926	1925
Gross	$13,797,373	$8,684,998
Operating costs	10,154,224	6,627,252
Operating income	$3,643,149	$2,057,746
Other income	211,704	314,665
Total income	$3,854,853	$2,372,411
Depreciation	762,762	804,657
Profit before depletion	$3,092,091	$1,567,754

Rand Gold Mine Dividends Up and Down

The accompanying statement shows dividends recently declared by gold-mining companies on the Rand. Those for the previous half-year and for last year are also given for comparison. It will be noted that some of the rates have declined, whereas others increased.

	Rate, Per Cent		
	1926		1925
	June	Dec.	Total
Brakpan Mines	25	25	47½
City Deep	10	7½	30
Consolidated Main Reef	3¾	..	5
Crown Mines	30	30	60
Geduld	17½	20	35
Govt. G. M. Areas	32½	40	65
Langlaagte Estate	5	7½	5
Meyer and Charlton	25	10	70
Modder B	40	40	75
Modder Deep	65	70	135
New Modder	55	60	115
New Primrose	..	5	2½
New State Areas	7½	7½	15
Robinson Deep B	7½	7½	15
Rose Deep	3¾	2½	12½
Simmer & Jack	..	10	10
Springs Mines	16½	17½	31¼
Sub-Nigel	7½	12½	8¾
Van Ryn Deep	22½	22½	50
Van Ryn Estate	2½	2½	12½
West Springs	5	5	7½
Witwatersrand	2½	7½	5
Wit. Deep	12½	11¼	18¾
T. G. M. Estates	2½	2½	6¼

Production

1926	Gold, Oz.	Silver, Oz.	Copper, Lb.	Lead, Lb.	Zinc, Lb.
Fourth quarter	2,454	576,061	7,893,427 ▼	14,183,604	13,293,644
Third quarter	3,090	678,630	7,980,470 ▲	15,133,812	11,890,863

Financial

1926	Fourth Quarter, 1926	Third Quarter, 1926
Value of metals produced	$3,333,741.61	$3,615,052.05
Operating costs	2,533,892.49	2,609,051.01
Operating income	$799,849.12	$1,006,001.04
Miscellaneous income	69,094.23	60,368.17
Total income	$868,943.35	$1,066,369.21
Less depreciation	192,793.22	190,673.84
Net income	$676,150.13	$875,695.37

Chilean Nitrate Situation Bad, Is London View

Synthetic Production Increases—Sales in Chile Decline—Production Largely Curtailed

Nitrogen production from synthetic sources increased from 480,000 to 650,000 tons, according to the circular issued at the year end by Aikman, of London. Other features of the nitrate situation affecting the situation in Chile, according to the same authority, are:

(a) Consumption of Chilean nitrate of soda decreased, being 290,000 tons (in terms of pure nitrogen), against 377,000 in 1925.

(b) The total production of synthetic fertilizers has been disposed of, whereas 1926 consumption of nitrate of soda, at 290,000 tons, was only 34 per cent of the productive capacity of the Chilean industry, which is around 850,000 tons of pure nitrogen.

(c) In 1927 synthetic production is expected to increase considerably, especially in Germany, where, besides the Farben Industrie, two large combines have recently been formed to erect plants to exploit new processes. This may result in a price-cutting war in the fall of 1927.

(d) Expert opinion is that consumption of Chilean nitrate will decrease further this spring, owing to prices of the synthetic commodity, the cotton crisis in America and Egypt, and failure to combat the organized selling and propagandist methods of the synthetic producers.

(e) The total visible supply of nitrate of soda on Dec. 31, 1926, was 1,826,000 tons, against 1,720,500 a year ago.

(f) Reduced forward sales of Chilean nitrate may be due to increased German production of nitrate of lime (containing the same percentage of nitrogen as Chilean nitrate—namely, 15½), at a cost £3 a ton lower than Chilean nitrate in Germany, and £2 lower in other countries.

(g) Sales by the Chilean Nitrate Producers' Association, July 1 to Dec. 31, 1926, were 790,000 tons; from July 1 to Dec. 31, 1925, 1,715,000 tons.

(h) Producing companies in Chile are gravely affected by reduced sales. Out of 149 oficinas, only 32 were working in December, 1926, against 60 in June and 91 in December, 1925.

Utah Metal & Tunnel Co. has increased the authorized capital stock from 1,000,000 shares (par $1) to 1,250,000 shares (par $1). These additional shares, if issued, will be to the Utah Delaware Mining Co. at par in the event that the Utah Delaware Mining Co., subsidiary of the Anaconda Copper Mining Co., elects to exercise an option to purchase the same under an agreement dated Jan. 25, 1926.

Sharpe Not Overly Optimistic on Zinc

THE United States statistics for December will, I am afraid, react on sentiment in Europe, which is unfortunate, because conditions were beginning to improve and better times in the market were expected, comments A. J. M. Sharpe, foreign correspondent of the American Zinc Institute, in his monthly review of zinc. As it is, the increase of 7,400 tons in United States stocks on Jan. 1, caused by the falling away in domestic consumption in December—according to particulars cabled to London—will not conduce to stronger markets on this side. Indeed, these unfavorable American statistics will influence the European situation adversely unless they are followed quickly by a definite pronouncement that a policy of curtailment of output is being introduced forthwith.

Market factors, says Mr. Sharpe, are also becoming alarmed at the expansion in the Canadian output of high-grade zinc, regular quantities of which find their way to Great Britain and the Continent.

Figures on the Belgian production for December are unavailable at the time of writing, but that country's output for 1926 will register a heavy increase over any post-war year. Similarly, production in Germany and Poland is continuing to expand, and although consumption in the Old World has not been at all bad, it has failed to keep pace in the last few weeks with European production supplemented by imports of high-grade zinc from Australia and North America. Thus it is that stocks in Europe have increased in the same way as in the United States.

Now that the coal strike in Great Britain is history, the industrial outlook is decidedly better, but it must necessarily be some little time before the various trades are able to make real headway. British zinc smelters resumed operations just before the close of last year, and in December accounted for a modest 500 tons of slab zinc. In the current month they should output at least 3,000 tons.

Germany has continued to be a most disappointing factor in the zinc situation, in that her consumption has failed to progress—owing mainly to the bad situation of the German brass works.

No longer is there any dearth of ores: indeed, there has been a superabundance of supplies for many months, and the smelting charges have just lately been stiffened. At the moment the formula is P (T—8) = 0.125 P. Taking a market price of zinc at £32, 8 units is equal to £2.56, and the returning charge of 0.125 is equal to £4. As these charges are based on delivery at, say, Antwerp, it will be realized that smelters have to make what profit they can out of £6.56 after payment of smelting, transport, and marketing charges.

Mr. Sharpe estimates world stocks of zinc on Jan. 1, 1927, as 43,600 metric tons, compared with 33,100 tons a month ago. The details follow:

	Metric Tons
United States	19,800
Canada	3,200
Australia (including unsold shipments afloat)	2,400
Germany-Poland	9,500
Belgium	4,000
France	1,500
Great Britain	1,000
Scandinavia	200
Far East	500
Elsewhere	1,500
Total	43,600

Imports and Exports of Ores and Metals in December, 1925 and 1926

Compiled from U. S. Department of Commerce Records

In pounds unless otherwise stated

Imports

	December 1925	December 1926
Antimony		
Ore, Gross weight	58,240	380,657
Ore, Antimony content	12,000	162,356
Liquated regulus or metal	2,301,583	2,050,772
Copper		
Ores	5,749,924	13,406,570
Concentrates	5,094,785	3,068,235
Regulus, coarse metal, cement copper	4,532	21,900
Imported from:		
Spain	209,839	493,267
Canada	2,492,523	7,448,659
Mexico	2,533,213	2,553,673
Cuba	2,222,080	.....
Chile	2,707,426	5,255,182
Peru	57,968	110,437
Other countries	626,192	635,487
Unrefined black, blister and converter copper in pigs, bars, and other forms	32,805,877	30,530,742
Imported from:		
United Kingdom	21,996	.....
Canada	4,089,447	1,181,612
Mexico	8,281,593	7,437,953
Chile	2,406,560	6,211,415
Peru	10,440,891	8,984,396
Portuguese Africa	7,013,447	6,715,366
Other countries	551,943	.....
Refined copper	14,219,549	14,917,459
Old and clippings for remanufacture	593,717	559,455
Composition metal, copper chief value	13,873	.....
Brass		
Old and clippings for remanufacture	849,241	1,046,306
Lead		
Ore and matte	7,601,592	14,548,430
Bullion or base bullion	19,427,690	15,593,840
Pigs and bars	1,400,469	1,571,958
Scrap lead, babbitt, solder, and other forms	23,495	418,098
Type metal and antimonial lead, Gross weight	2,697,864	556,999
Type metal and antimonial lead, Lead content	1,680,571	437,372
Manganese		
Ore, tons, Cuba, gross weight	4,563	175
Ore, tons, Other countries, manganese content	41,695	26,971
Pyrites, tons	6,228	16,773
Tin		
Ores, tons	30	10
Bars, blocks, and pigs	16,684,843	14,299,815
Imported from:		
United Kingdom	4,731,227	4,606,471
British Malaya	10,562,257	6,532,711
Dutch East Indies	.....	.....
Hongkong	358,673	380,890
Australia	314,074	268,800
Other countries	718,612	2,510,943
Zinc		
Ore, zinc content, Free	.....	.....
Ore, zinc content, Dutiable	3,460,756	2,001,615
Blocks, pigs and old	5,881	3,319

Exports

	December 1925	December 1926
Copper		
Ores, concentrates, composition metal, and unrefined	.....	238,188
Refined in ingots, bars, and other forms	.....	85,081,129
Exported to:		
Belgium	9,852,374	7,850,525
France	13,237,726	16,184,810
Germany	11,484,568	18,520,773
Italy	11,199,621	6,332,361
Netherlands	2,197,726	6,096,598
Spain	1,736,729	156,562
Sweden	1,239,183	2,139,730
United Kingdom	12,061,397	20,994,613
Other Europe	243,163	1,177,110
Canada	1,990,018	811,395
British India	.....	280,602
China	694,400	896,106
Japan	564,927	3,092,600
Other countries	433,491	547,344
Old and scrap	249,843	2,586,527
Pipes and tubes	212,874	319,037
Plates and sheets	959,955	800,629
Rods	2,823,679	4,399,617
Wire	955,549	676,721
Insulated copper wire and cable	2,281,744	1,270,046
Lead		
In pigs, bars, and other forms		
From domestic ore	2,209,375	1,088,539
From foreign ore	10,376,613	14,672,084
Exported to:		
France	750,685	168,031
Germany	2,912,786	5,153,346
Netherlands	1,288,355	112,058
United Kingdom	5,490,533	2,856,766
Other Europe	762,069	695,723
Brazil	179,281	56,016
Other South America	128,588	1,661,038
Japan	.....	4,235,095
Other countries	1,073,691	822,550
Other lead manufactures	1,734,813	1,698,983
Zinc		
Ore and concentrates, tons	5,912	1,710
Dross	1,057,754	397,970
Cast in slabs, blocks, or pigs	4,763,212	8,098,216
Exported to:		
Belgium	335,980	336,128
France	1,680,114	571,134
Germany	606,161	493,005
Italy	952,062	224,033
Netherlands	.....	804,107
United Kingdom	726,447	3,753,755
Other Europe	.....	313,618
British India	112,148	.....
Other countries	350,300	1,602,436
Sheets, strips, other forms	862,537	584,669
Dust	400,814	196,275
Other zinc manufacture	236,702	373,850

The Market Report

Active Week in Copper and Tin

Lead and Zinc Dull, With Narrow Range of Prices—Silver at New High Since September, 1926—Lower Copper Prices in Foreign and Domestic Markets

New York, Feb. 2, 1927—After several weeks of dullness the copper market came to life on Tuesday, though at the expense of price concessions on the part of producers, who offered freely at 13c. in the East and even shaded that figure by 5 points. The price of Copper Exporters, Inc., has been cut to 13.25c., effective today. Zinc and lead have been dull, and both consumers and dealers have bought tin in fair volume. Silver recovered in a fashion that is gratifying to producers, reaching 59¾c. today. This is accounted for by buying in both India and China, in the last-named country because of the annual New Year settlements. The sentiment among sellers of both copper and zinc is that the downward tendency of prices must eventually result in some curtailment of production. Lead is in something of the same plight. A moderate recession in industrial consumption is generally accepted as a fact, but statistics so far indicate no corresponding decline in the rate of output.

Daily Prices of Metals

Jan. Feb.	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y	99 Per Cent	Straits	N. Y.	St. L.	St. L.
27	13 00	63 75	65.125	7 40	7 20@7.225	6.50
28	13 00	63.125	64 875	7 40	7.175@7.20	6.50
29	12.925	63 375	65 125	7 40	7 175@7 20	6.45@6.50
31	12 80	63 50	65 375	7 40	7 175@7 20	6 50
1	12 75	64 25	66 50	7.40	7 225	6 575
2	12.75@12.775	64 50	67 00	7 40	7.225	6.575
Av.	12 873	63 750	65 667	7 400	7 204	6 521

Average prices for calendar week ending January 29, 1927, are: Copper, 12.992c.; 99 per cent tin, 63.854c.; Straits, 65.125c.; N. Y. lead, 7.417c.; St. L. lead, 7.225c.; zinc, 6.463c.; and silver, 57.396c.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis; i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Jan. Feb.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
27	54¾	55⅜	62¼	290¾	286½	26⅞	27 3/16	29 7/16	29¼
28	54⅝	55¼	62¼	287¼	283½	26 13/16	27⅛	29⅛	29¼
31	54 7/16	55	62	292¼	286¾	26 7/16	26¾	29¼	29⅛
1	54½	55	61¾	295¾	290	26 13/16	27⅛	29 11/16	29 13/16
2	54¼	54¾	61	297¾	291½	26½	26 15/16	29⅜	29½

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Jan.	Sterling Exchange "Checks"	Silver		Gold London	Jan. Feb.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
27	4 84½	57⅝	26 13/16	84s11 d	31	4.84½	58⅜	27 9/16	84s10½d
28	4.84⅝	57⅝	26⅞	84s11¼d	1	4 84½	58¼	27⅛	84s10¼d
29	4.84⅝	59⅝	27 13/16	.....	2	4 84½	59¾	27¾	84s11½d
					Avg.		58.583		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Average Metal Prices for January, 1927

Copper:	
New York Electrolytic	12.990
London Standard Spot	55.414
London Electrolytic Spot	62.375
Lead:	
New York	7.577
St. Louis	7.392
London Spot	27.485
London Forward	27.786
Silver:	
New York	55.795
London	25.863
Sterling Exchange	484.775
Zinc:	
St. Louis	6.661
London Spot	30.979
London Forward	30.938
Tin:	
99 per cent	64.785
Straits	66.415
London	297.804
Quicksilver	101.200
Antimony	13.910
Platinum:	
Refined	109.520
Crude	99.820
Aluminum, 98 per cent	26.270

Copper Prices Reduced

Some business was done last Thursday at 13¼c. to 13¾c. in the East, and a fair volume at 13⅜c. at high-freight-rate destinations. However, on Friday, Saturday and Monday buyers were conspicuously absent, and some sellers who had been holding nominally at 13⅜c. delivered in Connecticut reached the conclusion that they must sell some copper. As a consequence upward of 15,000,000 lb. changed hands. Virtually all of the important producers participated, the prices ranging from 12.95c. in Connecticut to 13¼c. in the Middle West.

Today domestic buyers seem to have lost interest again, although sales have been reported at both 12.95c. and 13c. This may be partly accounted for by a sharp drop on the metal exchange in London, which accompanied the reduction by Copper Exporters, Inc., of their official price from 13.50c. to 13.25c., effective today. There is believed to be important buying under the market, both here and abroad, which ought to develop soon. The question is at what price the buying will take place.

A survey of the brass industry indicates that the volume of January orders is only about 10 per cent under the extremely high monthly average of the year 1926. On the other hand, orders of wire mills are said to be distinctly smaller, this being a reflection of the unsettled market for refined copper. These two markets normally move in close accord. Consumption by the automobile industry at the moment is radically curtailed, but the next month should see a revival here. According to figures just issued by the American Bureau of Metal Statistics, consumption by principal domestic industries

that use the metal totaled 443,825 tons in 1926, against 418,900 in 1925. The best quarter was the third, when 119,200 tons was used. The average for the other three quarters was about 108,000, with a comparatively narrow variation in the individual figures.

Today the American Brass Co. reduced the prices of its standard products to the schedule that corresponds to a 13c. base price for copper.

Lead Prices Hold Well

No further price concessions were made in the New York lead market in the week ending today, the price remaining at 7.40c., this being the contract quotation of the American Smelting & Refining Co., as well as the price realized on most other sales. Business was much less than last week, and sellers are not particularly optimistic, though there does not seem to be any particular pressure on the market and prices do not seem likely to decline further unless renewed weakness comes from London. In the Middle West, practically all sellers are quoting within 2½ points of one another, and have done a moderate amount of business. The sharp advance in London prices yesterday caused quite numerous inquiries and led sellers to revise their quotations upward to 7.225c., after having quoted 7.175@7.20c. in the previous days. Several orders were placed, with the demand well distributed among the various classes of trade. Most of the requirements for the week have been for prompt or February shipment, with a few scattering orders for March. The decline in London today, although not quite equal to the advance yesterday, was disappointing and prevented the buying interest of yesterday from continuing.

Indications are that consumption has slumped slightly in a variety of lines, including battery, lead-covered cable, ammunition, and mixed-metal manufactures. This may, however, be a temporary condition brought about by the long-continued decline in prices, which has caused manufacturers and consumers to postpone buying as long as possible. In other words, should a firm market be reported abroad for several consecutive days, excellent buying here would probably result.

Corroding grades of lead are at the customary premium of $2@$3 per ton.

Zinc Quiet

Buying by dealers and speculators helped the zinc market during the week, as consumers were not particularly interested. Some curtailment has already been effected in Joplin, and further progress in the same direction may be expected. This is counted upon by producers to help maintain the market in spite of an apparent weak position in London. High-Grade is quoted at from 8.50c. to 8.75c., with most of the business at the lower figure. The differential between the St. Louis and New York prices for Prime Western continues at 35c. per hundred, the freight rate between the two points.

Tin Market Active

Somewhat lower prices for tin, prompt Straits again dropping below 65c. during the week, stimulated an excellent demand from both dealers and consumers, and for all positions. Yesterday a sharp advance was made, but business was still good, as reports emanating from London were that shipments from the Far East would only be from 4,500 to 5,000 long tons this month, and this supply was not considered sufficient. Weather conditions, and closing down of some smelting units for overhauling, are held to be responsible. May tin commands about 1½c. premium over the price of prompt Straits, which latter rules at about 67c. today.

Silver Up to 59¾c.

Silver has shown a sharp advance during the last week, prices reaching a level which has not been touched since the latter part of September, 1926. Uncertainty due to conditions in China caused bears to cover, and purchases by India for shipment in time for the February settlement added to the volume of buying orders.

Mexican Dollars (Old Mexican pesos): Jan. 27th and 28th, 43⅞c.; 29th, 45⅜c.; 31st, 44⅜c.; Feb. 1st, 44½c.; 2d, 45½c.

Francs and Lire Steady

Francs and lire are substantially unchanged from last week, the principal interest in the foreign exchange market recently being in Spanish pesetas, which have advanced to 16.90c. Closing cable quotations on Tuesday, Feb. 1, were: francs, 3.93½c.; lire, 4.28c.; and marks, 23.70½c. Canadian dollars, ⅜ per cent discount.

Zinc Blende Unchanged—Lead Ore Lower

Joplin, Mo., Jan. 29, 1927

Blende

High	$47.65
Premium blende, basis 60 per cent zinc	$43.00@ 44.00
Prime Western, basis 60 per cent zinc	42.00
Fines and slimes, 60 per cent zinc	41.00@ 38.00
Average settling price, all zinc	43.80

Galena

High	$99.60
Basis 80 per cent lead	90.00
Average settling price, all lead	96.28

Shipments for the week: Blende, 9,911; lead, 1,482 tons. Value, all ores the week, $576,840.

Shipments the month: Blende, 52,617; calamine, 81; lead, 8,689 tons. Value, all ores the month, $3,211,380.

Sellers disposed of but 6,900 tons last week, when the price was lowered to $42 basis Prime Western, and sales will hardly exceed that tonnage this week. Buyers loaded close up on ore already purchased, and will have for loading next week only the tonnage to be purchased today. With those which will cease operations tonight, approximately one-fifth of all the mills in the district will be idle. The companies still operating mills, except those owned by smelting companies, are disposing of only a limited tonnage.

Lead was lowered to $90 per ton today, with some settlements still made on the $100 basis—concentrate purchased prior to the decline.

Platteville, Wis., Jan. 29, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$44.75
Lead Ore	
Lead, basis 80 per cent lead	$95.00

Shipments for the week: Blende, 1,622 tons; lead, 40 tons. Shipments for the year: Blende, 6,054; lead, 140 tons. Shipments for the week to separating plants, 2,811 tons blende.

Demand for Steel Shows Improvement

Bars, Shapes, and Wire Products Lower —Pig Iron and Coke Quiet and Easier

Pittsburgh, Feb. 1, 1927

The first month of the new year brought approximately as much improvement in steel demand and increase in steel production, over the December rate, as should ordinarily be expected. General ground was lost in September and October in buying, and later in production and shipments, and the coming of the new year did not correct this, bringing merely a modicum of seasonal improvement, which is likely to continue this month.

Steel prices do not give as good an account of themselves. Sheets have not weakened much farther, nor have strips, but bars and shapes are somewhat easier, with more business going at the 1.90c. figure, and wire products are openly shaded, on desirable orders, by a dollar a ton. In one or two other lines there is occasional unsteadiness.

Pig Iron—The Valley market remains quiet, with prices unchanged. Bessemer, $19.50; basic, $18; foundry, $18.50.

Connellsville Coke—The market remains quiet and foundry coke is easier. Spot furnace, $3.25; spot foundry, $4.25@$4.75.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified. London prices are according to latest mail advices.

Aluminum—Per lb., 99 and 98 per cent grades, 26c. Market quiet. London, 98 per cent, £105@£107 per long ton for domestic purposes.

Antimony—Per lb., duty paid, spot: Chinese brands, 14½@15c.; April, 13¾@14¼c. Cookson's "C" grade, spot, 17½c. Market better with little consuming demand in evidence.

Chinese needle, lump, 8c. Standard powdered needle, 200 mesh, 10c. White oxide, Chinese, 99 per cent Sb_2O_3, 16½c. Nominal.

Bismuth—Per lb., in ton lots, $2.70@$2.75. London, 10s.

Cadmium—Per lb., 60c. London, 1s. 10½d.@1s. 11d. for American metal; 1s. 10d. for Australian metal.

Cobalt—F.o.b. Canadian works, per lb., shot, 96@98 per cent, $2.50. Black oxide, 70 per cent, $2.10. London, 8s. 6d.@10s. for metal; 8s. for black oxide; 8s. 10d. for gray.

[1]Germanium Oxide—Per gm. in 300- to 500-gm. lots, $5.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Iridium—Per oz., $115@$120 for 98@99 per cent sponge and powder. London, £32½ in iridio-platinum; £17@£20, nominal, for sponge and powder.

[1]**Lithium**—Per lb., 95@96 per cent grade in 1- to 5-lb. lots, $65.

Magnesium—Per lb., in ton lots, 8-lb. ingots (3x3x15 in.), 75c.; 3-lb. sticks (1¾x33 in.) 80c.; 10-oz. sticks, (1x12 in.), 90c. Market firm. Increasing demand reported for light alloys. London, 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]**Molybdenum**—Per kg., 99 per cent, $25; C. P. metal, $80.

Monel Metal—Base price for shot, 32c. per pound.

Nickel — Per lb., ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade). London, £170@£175 per long ton according to quantity. Demand continues good.

Osmium—Per oz., $55@$60; London, £15@£18.

Palladium—Per oz., $58@$62, depending on quantity and terms. Pure metal as a constituent of crude platinum, $50@$56 per oz. London, £11@£12, though nominal prices are higher.

Platinum — Official price on refined metal, $107 per oz. Price reduced $3 on Thursday, Jan. 27. Open market cash sales of large lots at $101@$102. Pure metal as a constituent of crude platinum, $98@$99.

London, £22½ per oz. for refined, and £19½@£20 for crude and scrap. Dull.

Quicksilver—Per 75-lb. flask, $101@$103. San Francisco wires $100.33. The price has been strengthening for several weeks. London, firmer at £17 10s.

Radium—$70 per mg. radium content.

Rhodium—Per oz., $55@$60; London, £9½@£13. Nominal.

Ruthenium—Per oz., $40@$45, nominal. London, £7½@£10.

Selenium — Black, powdered, amorphous, 99.5 per cent pure, $1.90@$2 per lb. in ton lots. London, 7s. 6d.@7s. 8d.

Tellurium—Per lb., $2.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $10 per lb. in 25-lb. lots.

Tungsten Powder—Per lb., 97 to 98 per cent pure, $1.05.

[1]**Zirconium Metal**—Per lb., 98 per cent grade, $30 in 5- to 10-lb. lots.

Metallic Ores

Chrome Ore—Per net ton, f.o.b. eastern shipping points, $21.50@$23.50 for 45 to 50 per cent Cr_2O_3 ore. Prices firm and demand good.

Iron Ore—Lake Superior ores, per long ton, lower Lake ports; prices for 1927 season not yet established.

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

High-phosphorus foundry, over 0.18 per cent P, $4.15.

Eastern ores, cents per unit, delivered at furnaces: Foundry and basic, 53 to 63 per cent, 9@10½c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 10¼@10¾c.

Spanish low-phosphorus, 52@54 per cent, 10@11c.

Algerian, low-phosphorus, 9¼@9¾c.

Spanish foundry or basic, 50@54 per cent, 8¾@9¼c.

Swedish foundry or basic, 66@68 per cent, 9@9½c.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian (washed), 53@55 per cent, 38@40c.

[1]Chemical grades, powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—Per lb. of MoS_2 for 85 per cent MoS_2 concentrates f.o.b. *Colorado*, 48@50c.

Tantalum Ore—Nominally, 75c. per lb. for ore containing 60 per cent Ta_2O_5 and 20 per cent Cb_2O_5.

Titanium Ore—Ilmenite, 52 to 60 per cent TiO_2, f.o.b. Atlantic seaboard, $12@$20 per gross ton, according to grade and impurities. Low-grade, domestic, 32 to 35 per cent, about $7@$8 per gross ton. Rutile, 96 per cent concentrate, 11c. to 13c. per lb.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $10.75@$11; Western scheelite, $11.25@$11.50.

Uranium Ore—Minimum 5 per cent U_3O_8 per pound of U_3O_8 contained, nominal at $5, f.o.b. Montrose, Colo.

Vanadium Ore—Containing 5 per cent V_2O_5, nominal at 25c. per lb. of V_2O_5, f.o.b. Montrose, Colo.

Foreign concentrate (lead vanadate) 12 to 18 per cent V_2O_5, 55@60c. per pound V_2O_5, duty paid, seaboard. Nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can serve only as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can be ascertained only by direct negotiation between buyer and seller.

[1]**Amblygonite**—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Asbestos—F.o.b. *Quebec* mines, tax and bags included, per ton:

Crude No. 1, $525; crude No. 2, $325; spinning fibers, $200; magnesia and compressed sheet fibers, $125@$150; shingle stock, $80; paper stock, $40@$45; cement stock, $25; short fibers, $10@$17.50; floats, $15. Active market for all spinning grades and shingle stock, with increased "trust" prices for crude and No. 2 and spinning fiber.

No. 1 Rhodesian crude, $325; No. 2, $250@$300 per ton, c.i.f. New York.

Barytes—F.o.b. mines, per ton, bags extra:

Georgia: Barytes ore, crude, $7.50.@$8. Demand good. Wet ground, off-color, $12@$18, depending on analysis. Market spotty.

Missouri: Water ground and floated, bleached, $23; $25 in less than car lots, f.o.b. works. Crude ore, 93 per cent $BaSO_4$, not to exceed 1 per cent iron, $8, f.o.b. mines. Market good.

Bauxite—No. 1 chemical ore, over 60 per cent Al_2O_3, less than 5 per cent SiO_2, and less than 2 per cent Fe_2O_3, $8 per long ton, f.o.b. Georgia mines.

Foreign, per metric ton, c.i.f.: Dalmatian, low SiO_2, $5@$6.50; Istrian, $5.50@$7; French, red, $6@$7.50.

Borax—Carload lots, in bags, per lb.; crystals, 4¼c.; granulated or powdered, 4c.; f.o.b. plant, *Pennsylvania*.

[1]**Celestite**—90 per cent $SrSO_4$, finely powdered, $27 per ton in carload lots.

Chalk—Crude, in bulk, per ton c.i.f. New York, $4.75@$5.

China Clay (Kaolin)—F.o.b. *Virginia* mines, per ton; crude, lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$15; ground, $7@$10.

Florida, pressed pottery, bulk, $13; ground, No. 1, $20; No. 2, $15. Sprayed mineral flour No. 1, $20; No. 2, $17.

1A grades, domestic, $16@$18, f.o.b. Delaware plants. Good demand.

Imported English, f.o.b. American ports: Lumps, $13@$21; powdered, $45@$50.

Diatomite—Per short ton, f.o.b. plant: Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $30; natural aggregate, ¼ in., $20; air-floated powder, $40. Over 85 per cent silica, 98 per cent through 200 mesh, $15@$16 depending on quantity. Market good.

Emery — F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb. Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½c. Market good.

Feldspar — F.o.b. mine or grinding plant:

North Carolina: No. 1 pottery grade, $6.50@$7.50 per long ton. Market very good.

New Hampshire: Pottery grade, $8 per ton; soap grade, $8.50. Market fair.

New York: Per ton, f.o.b. cars, No. 1 crude, $9. Market good.

Tennessee: No. 1, pottery, 140 mesh, $16 per ton; 200 mesh, $18. No. 2, enamel, 140 mesh, $14; 200 mesh, $16. Demand good.

Maine: Pottery grade, ground, $19 per ton. Market good.

Fluorspar—F.o.b. *Kentucky* and *Illinois* mines, per short ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $18. Foundry lump, 85-5, $20. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50 in bulk; $36.50 in bags or barrels. Acid lump, 98-1, $30 in car lots. No change in prices. No spot demand, outlook uncertain.

New Mexico: 85-5 gravel, $16.50; 85-5 lump, $15.50; 93-3 lump, $19; 96-3, ground 100 mesh, $35, bulk; $40 bags. Market strong. No stock on hand.

Foreign spar, duty paid, $16.75@$17.25, tidewater.

Fuller's Earth—Per ton, f.o.b. *Florida:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $15; 100 mesh "up," $8; 200 mesh "up," $15. Market fair at unchanged prices.

Powdered, imported, duty paid, $24@$25 per ton.

Garnet — Domestic, per ton f.o.b. mines, $85. Market easy.

Spanish grades, $60, c.i.f. port of entry.

Gilsonite—Per ton, carload lots, f.o.b. mines *Colorado:*

[1]Price furnished by Foote Mineral Co., Philadelphia.

selected grade, $33; seconds (mine run), $25.50.

Graphite—F.o.b. *New York*, per lb.: Ceylon lump, 8@9c.; chip, 6½@7½c.; dust, 3@6c.; Madagascar flake, 6@7c. Market dull.

No. 1 flake, 10c. up; fine flake, 9c. up. Foundry facings, 4c. up. Amorphous, fine ground, 4c. up; fine ground crystalline, 5c. up. Crude amorphous graphite, $15@$35 per ton according to grade. Market dull and competition keen.

Greensand—Per ton, f.o.b. cars, *New Jersey:* screened and bagged, best grade in carload lots, $30. Better demand.

Gypsum—Per ton f.o.b. mill, depending upon location: Crushed, $2.75@$3; ground, $4@$8; agricultural, $6@$12; calcined, $7@$10.

Iron Oxide (See Ocher)—Standard Spanish red, 2½@4c. per lb.; domestic earth, 2@4½c.

Kaolin—See China Clay.

[1]**Lepidolite**—20@$30 per ton for ordinary grades. Nominal.

Limestone — F.o.b. shipping points, depending on location: either lump or crushed, 75c.@$2 per ton.

Agricultural, 75c. up to $4 or $5 for crushed or pulverized. Prices depend upon source, purity, and fineness.

Magnesite—Per short ton, f.o.b. *California* mines: Grade "A" calcined, 80 per cent through 200 mesh, $40; grade B, $38; dead burned, $33; crude, $14. F.o.b. eastern seaboard, calcined, $40. Market fair.

Mica—F.o.b. plant, per ton:

New Hampshire: Mine run, $360; clean shop scrap, $24; mine scrap, $20. White dry ground, 20 mesh, $28; 40 mesh, $35; 60 mesh, $55; 100 mesh, $70; 200 mesh, $85. Fair volume of business. Prices lower for all grades.

North Carolina: White, ground, 20 mesh, $35; 70 mesh, $100.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York*, duty paid: No. A1, $2.75@$3; No. 1, $2.60; No. 2, $2.30@$2.50; No. 3, $1.25; No. 4, 75c.; No. 5, 40@45c. Grades depend on size of sheets. Good demand for Nos. 2 and 4.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher—F.o.b. *Georgia* mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels; washed and water floated, $25@$28; second grade, 99 per cent through 225 mesh, $19. Market good.

Phosphate—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $7; 75 per cent, $6.25; 74@75 per cent, $6; 70 per cent, $4.50; 68 per cent, $4.10; 66 per cent, $4. Prices firm.

Florida, pebble domestic: 76@77 per cent, $6; 75 per cent, $5.25; 74@75 per cent, $5; 72 per cent, $4; 70 per cent, $3.50. Market dull, on account of small buying by fertilizer manufacturers.

Tennessee, ground, 95 per cent through 100 mesh, basis 65 per cent B.P.L. (tri-calcium phosphate), $8 per short ton, with unit differential of 20c. per ton. Market slow. Lump rock for acid manufacturers per gross ton, $5.75 on 75 per cent basis; $4.50 for 72 per cent basis.

Potash—Advances in the domestic market in line with reported action of National Potash Council in Germany raising prices 9½ per cent have not materialized as yet. The ruling contract prices are as follows:

	Bags	Bulk
Muriate of potash 80 @ 85 per cent, basis 80 per cent....	36.40	34.80
Sulphate of potash 90@95 per cent, basis 90 per cent....	47.30	45.70
Sulphate of potash-magnesia 48@53 per cent, basis 48 per cent	27.25	25.65
Manure salt 30 per cent....	21.75	18.75
Manure salt 20 per cent.....	15.40	12.40
Kainit 14@16 per cent.....	12.50	9.50
Kainit 12.4 per cent.....	12.00	9.00

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.

Discounts: 5 per cent on minimum of 50 tons K_2O; 6 per cent on 100 tons; 7 per cent on 300 tons; 10 per cent on 500 tons.

Pumice Stone—In barrels, per lb., powdered, 2½@4c.; selected lumps, 5@7c.

Pyrites—Tharsis, per long ton unit of sulphur, c.i.f. U. S. ports; guaranteed 48 per cent sulphur, furnace size, 2½-in. diameter, 13¾c. Cinder from ore to remain property of buyers. Market better.

[1]**Quartz Rock Crystals**—Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 40c. per lb. in ton lots. For optical purposes, double above prices.

Silica—Water ground and floated, per ton in bags f.o.b. Illinois: 400 mesh, $31; 350 mesh, $26; 250 mesh, $18. Market fair.

Glass sand, f.o.b. producing plant, 75c.@$5 per ton; molding sand, 65c.@$3.50; blast sand, $1.35@$3.50.

[1]**Spodumene**—$20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$18 per ton for domestic, f.o.b. *Texas* mines; $22 for export, Atlantic ports. Prices in reality are on a c.i.f. basis, but the average price reduced to an f.a.s. figure is about as given. Good shipment against contracts. Open prices $1 higher than above.

Talc—Per ton, carload lots, f.o.b. works, containers included:

Vermont: 99 per cent through 200 mesh, extra white, $10; 96 per cent through 200 mesh, medium white, $9; packed in 50-lb. paper bags. Strong competition; buyers' market. Prices easier.

New York: Double air-floated, 200 mesh, $13.75; 325 mesh, $14.75. Demand fair.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, $10@$12; market good.

Tripoli—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri:* Once ground through 40 mesh: rose and cream colored, $14. Double ground through 110 mesh: rose and cream, $17. Air-floated through 200 mesh: rose and cream, $25; mill run, $15. Business good.

[1]Price furnished by Foote Mineral Co., Philadelphia.

[1]**Zircon**—Freight allowed east of Mississippi River; 95 per cent, 3c. per lb., f.o.b. mines, in carload lots.

Mineral Products

Arsenious Oxide (white arsenic)—3⅝@3¾c. per lb. London, £17 per long ton for Cornish white.

Calcium Molybdate—$1.20 per lb. of contained Mo, delivered.

Copper Sulphate — 4.80c. per lb. for either large or small crystals. Good demand from Mexico and South America.

Sodium Nitrate—Crude, per 100 lb., ex vessel, Atlantic ports, $2.60 for spot; future delivery $2.65.

Sodium Sulphate (Salt Cake)—Per ton, bulk, f.o.b. works, $18@$20.

Zinc Oxide—Per lb. in bags, in car lots: Lead-free, 6½c.; 10, 20 or 35 per cent leaded grades, 6½c.; French red seal, 9⅜c.

Ferro-Alloys

[1]**Ferrocerium**—Per lb., $5.50.

Ferrochrome—Per lb. of contained chromium, 60@70 per cent chromium, 4 to 6 per cent carbon, 10½@11c. Market active.

Ferromanganese—Domestic and foreign, 78@82 per cent, $100 per gross ton furnace, for delivery during first half of 1927. Spiegeleisen, 19@20 per cent, $36@$37 on carload business, f.o.b. furnace; 16@19 per cent, $34@$35.

Ferrophosphorus—Electrolytic, 18 per cent P, $91 per ton; 24 per cent, $122.50; f.o.b. *Alabama* and *Tennessee*.

Ferrosilicon—Per gross ton, f.o.b. works, freight allowed on carload lots east of Mississippi River: 50 per cent, $85; 75 per cent, $145; 14@16 per cent, $45. Active market.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—$1.05 per lb. of W contained, f.o.b. works. Active but spotty.

[1]**Ferro-uranium**—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works in 500-lb. lots.

Ferrovanadium—Per lb. of V contained, f.o.b. works, $3.15@$3.75, depending on grade.

Metal Products

Rolled Copper — Sheet, 21½c.; wire, 15¼@15¾c. per lb., f.o.b. mill.

Lead Sheets—Full rolled, 11c. per lb.; clipped, 11¼c.

Nickel Silver—28½c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 18¾c. per lb.; rods, 15¾c. per lb.

Zinc Sheets—11c. per lb., f.o.b. works.

Refractories

Chrome Brick—$45 per net ton, f.o.b. shipping point.

Fireclay Brick—First quality, $40@$43 per M., Ohio, Kentucky, Central Pennsylvania; second quality, $35@$40.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick — $40 per M., Pennsylvania and Ohio; $50 Alabama and Illinois.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 2½c. per lb. Brick, straights, 80c.@$1 each.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London Spot		Sterling Exchange	
	1926	1927	1926	1927	1926	1927
January	67.795	55.795	31.322	25.863	485.295	484.775
February	66.773	.....	30.797	.....	485.852	.....
March	65.880	.....	30.299	.....	485.606	.....
April	64.409	.....	29.682	.....	485.702	.....
May	65.075	.....	30.125	.....	485.485	.....
June	65.481	.....	30.248	.....	486.000	.....
July	64.793	.....	29.861	.....	485.755	.....
August	62.380	.....	28.773	.....	485.293	.....
September	60.580	.....	27.904	.....	484.845	.....
October	54.505	.....	25.291	.....	484.475	.....
November	54.141	.....	25.192	.....	484.359	.....
December	53.466	.....	24.733	.....	484.553	.....
Year	62.107	.....	28.686	.....	485.268	.....

New York quotations, cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London Spot			
	Electrolytic		Standard		Electrolytic	
	1926	1927	1926	1927	1926	1927
January	13.822	12.990	59.013	55.414	65.325	62.375
February	13.999	.....	59.669	.....	66.375	.....
March	13.859	.....	58.603	.....	65.489	.....
April	13.706	.....	57.200	.....	64.600	.....
May	13.599	.....	56.494	.....	64.313	.....
June	13.656	.....	56.778	.....	64.591	.....
July	13.924	.....	57.864	.....	65.625	.....
August	14.174	.....	58.857	.....	66.857	.....
September	14.062	.....	58.705	.....	66.528	.....
October	13.862	.....	58.304	.....	66.298	.....
November	13.576	.....	57.293	.....	65.551	.....
December	13.302	.....	56.869	.....	64.114	.....
Year	13.795	.....	57.971	.....	65.472	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London			
	1926	1927	1926	1927	1926 Spot	1926 3 Mos.	1927 Spot	1927 3 Mos.
January	9.255	7.577	9.102	7.392	34.778	34.584	27.485	27.786
February	9.154	.....	8.991	.....	33.903	33.903	.....	.....
March	8.386	.....	8.165	.....	31.625	31.921	.....	.....
April	7.971	.....	7.764	.....	28.775	29.284	.....	.....
May	7.751	.....	7.538	.....	28.253	28.731	.....	.....
June	8.033	.....	7.876	.....	29.986	30.142	.....	.....
July	8.499	.....	8.383	.....	31.716	31.545	.....	.....
August	8.908	.....	8.722	.....	32.756	32.345	.....	.....
September	8.786	.....	8.515	.....	32.085	31.790	.....	.....
October	8.402	.....	8.130	.....	30.821	30.696	.....	.....
November	8.005	.....	7.800	.....	29.270	29.563	.....	.....
December	7.855	.....	7.688	.....	28.932	29.259	.....	.....
Year	8.417	.....	8.223	.....	31.075	31.147	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	1926	1927	1926	1927	1926	1927
	99%		Straits		Spot	
January	61.415	64.785	62.275	66.415	282.038	297.804
February	62.653	.....	63.705	.....	287.107	.....
March	63.472	.....	64.505	.....	292.288	.....
April	61.962	.....	63.389	.....	281.388	.....
May	60.165	.....	62.305	.....	270.125	.....
June	58.409	.....	60.611	.....	268.352	.....
July	61.365	.....	63.091	.....	282.102	.....
August	63.875	.....	65.260	.....	293.690	.....
September	66.535	.....	68.895	.....	306.273	.....
October	68.225	.....	70.245	.....	312.548	.....
November	68.667	.....	70.630	.....	309.284	.....
December	66.635	.....	68.514	.....	306.994	.....
Year	63.615	.....	65.285	.....	291.016	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London			
	1926	1927	1926 Spot	1926 3 Mos.	1927 Spot	1927 3 Mos.
January	8.304	6.661	38.059	37.363	30.979	30.938
February	7.759	.....	36.053	35.956	.....	.....
March	7.332	.....	34.090	34.247	.....	.....
April	7.001	.....	32.503	32.863	.....	.....
May	6.821	.....	32.038	32.413	.....	.....
June	7.112	.....	33.244	33.398	.....	.....
July	7.411	.....	34.045	34.270	.....	.....
August	7.376	.....	34.173	34.524	.....	.....
September	7.413	.....	34.389	34.415	.....	.....
October	7.296	.....	34.256	34.146	.....	.....
November	7.199	.....	33.491	33.483	.....	.....
December	7.018	.....	32.915	32.895	.....	.....
Year	7.337	.....	34.105	34.164	.....	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) Refined New York		Platinum (c) Crude New York	
	1926	1927	1926	1927	1926	1927	1926	1927
Jan	23.490	13.910	87.960	101.200	118.200	109.520	113.230	93.820
Feb	21.676	.....	87.580	.....	113.909	.....	108.341	.....
March	19.708	.....	88.194	.....	112.000	.....	106.278	.....
April	17.462	.....	89.769	.....	111.538	.....	103.731	.....
May	12.170	.....	91.365	.....	108.960	.....	102.900	.....
June	11.106	.....	91.346	.....	111.000	.....	106.615	.....
July	14.490	.....	90.163	.....	114.692	.....	109.000	.....
Aug	15.957	.....	89.260	.....	116.000	.....	108.692	.....
Sept	15.325	.....	91.425	.....	116.840	.....	108.600	.....
Oct	13.943	.....	97.260	.....	112.240	.....	106.000	.....
Nov	13.385	.....	99.000	.....	112.000	.....	105.250	.....
Dec	13.142	.....	99.510	.....	111.846	.....	105.385	.....
Year	15.988	.....	91.903	.....	113.269	.....	106.999	.....

(a) Antimony quotations in cents per pound, for ordinary brands. (b) Quick silver in dollars per flask of 75 lb. (c) Platinum in dollars per ounce

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1926	1927	1926	1927	1926	1927
January	22.76	21.40	21.76	20.01	22.26	20.26
February	22.76	.....	21.76	.....	22.26	.....
March	22.76	.....	21.76	.....	22.26	.....
April	21.38	.....	20.66	.....	21.05	.....
May	21.12	.....	19.76	.....	20.76	.....
June	20.76	.....	19.76	.....	19.80	.....
July	20.44	.....	19.26	.....	19.49	.....
August	19.87	.....	19.18	.....	19.26	.....
September	20.11	.....	19.26	.....	19.30	.....
October	20.76	.....	19.76	.....	19.97	.....
November	21.90	.....	20.46	.....	20.96	.....
December	21.26	.....	20.26	.....	20.53	.....
Year	21.31	.....	20.29	.....	20.64	.....

In dollars per long ton.

Monthly Crude Copper Output in Short Tons

Domestic

	1926					
	July	August	Sept.	Oct.	Nov.	Dec.
Alaska shipments	2,838	3,093	2,078	3,073	3,769	2,372
Butte & Superior	.....	.....	835†	.....	.....	.....
Calumet & Arizona	1,666	1,960	1,793	2,380	1,833	1,951
Magma	1,345	1,315	1,211	1,198	1,155	1,148
Miami	2,200	2,447	2,251	2,468	2,412	2,268
New Cornelia	3,466	3,194	3,292	3,556	4,227	3,347
Nevada Con	.....	.....	†29,090	.....	.....	.....
Old Dominion	985	1,350	797	908	1,127	1,120
Phelps Dodge	6,775	6,723	5,866	5,493	6,638	4,735
United Verde Extension	1,738	1,765	1,756	1,901	1,677	1,586
Utah Copper	.....	.....	†30,902	.....	.....	.....
Tennessee Copper	543	511	499	523	524	486

Foreign

Boleo, Mexico	1,106	1,124	898	992	992	.....
Furukawa, Japan	1,526	1,550	1,532	1,431	1,668	.....
Granby Cons., Canada	1,777	1,805	1,506	1,623	1,626	*2,355
Union Miniere, Africa	7,716	8,188	7,623	6,525	7,260	7,150
Mount Lyell, Aust	.....	.....	†2,182	.....	.....	.....
Sumitomo, Japan	1,498	1,396	826	.....	1,637	.....
Bwana M'Kubwa	.....	.....	195	255	383	420

*Starting with December Allenby production is included. †Three months.

Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

	1924		1925		1926	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	66,631	2,149	74,789	2,412	71,026	2,291
February	65,681	2,265	68,967	2,463	68,131	2,433
March	65,181	2,102	74,901	2,416	75,728	2,443
April	66,073	2,202	70,667	2,356	73,454	2,448
May	65,608	2,116	70,574	2,276	73,542	2,372
June	63,933	2,131	59,894	2,330	71,317	2,377
July	64,787	2,090	68,507	2,210	72,278	2,330
August	66,756	2,153	68,090	2,196	72,014	2,323
September	63,800	2,127	67,720	2,272	72,672	2,421
October	68,989	2,225	71,042	2,292	75,099	2,423
November	68,291	2,276	67,400	2,247	74,947	2,498
December	67,647	2,182	69,566	2,244	72,205	2,329
Total	793,377	.....	842,117	.....	872,318	.....
Monthly average	66,115	.....	70,176	.....	72,693	.....
Average of daily rate	.....	2,168	.....	2,307	.....	2,390

Mining Stocks—Week Ended January 29, 1927

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	48	46¾	47⅜	Ja. 15, Fe. 21	Q 0.75
Arcadian Consol.	Boston	*55	*50	*50	...	...
Ariz. Com'l	Boston	9	9	9	Ja. 7, Ja. 28	0.50
Calaveras	N. Y. Curb	...	...	1⅞	...	...
Calumet & Arizona	New York	66½	66⅜	66½	De. 3, De. 20	Q 1.50
Calumet & Hecla	Boston	16⅜	16	16⅛	Fe.28, Ma.15	Q 0.50
Cerro de Pasco	New York	61⅛	60⅜	60⅛	Ja.13,Fe.1, Q	1.00
Chile Copper	New York	35⅜	35	35	Ma.4,Apr.1, Q	0.62½
Chino	New York	...	...	22⅛	...	...
Con. Coppermines	N. Y. Curb	2⅛	2⅛	2⅛	...	...
Copper Range	Boston	14⅛	13¼	13⅜	May, 1926	1.00
Crystal Copper	Boston Curb	*29	*26	*27	...	...
East Butte	Boston	2⅛	2¼	2¼	Dec., 1919	0.50
First National	Boston Curb	*8	*8	*8	Feb., 1919	0.15
Franklin	Boston	...	...	*25	...	...
Granby Consol.	New York	32½	31⅛	31⅛	May, 1919	1.25
Greene-Cananea	New York	32⅛	29⅛	29⅛	Nov., 1920	0.50
Hancock	Boston	*75	*50	*75	...	...
Howe Sound	New York	39⅜	38⅛	39	De.31, Ja.15	Q 1.00
Inspiration Consl.	New York	24⅛	24	24⅛	De.16, Ja.3, Q	0.50
Iron Cap	Boston Curb	2⅛	2⅛	2⅛	...	...
Isle Royale	Boston	11⅛	11	11	Fe.4, Fe.19	Q 0.50
Jerome Verde Dev.	N. Y. Curb	...	...	*39	...	...
Kennecott	New York	61⅛	61	61⅛	De. 3, Ja. 2	Q 1.25
Lake Copper	Boston	...	...	1	June, 1925	0.50
Magma Copper	New York	34⅞	33⅜	34⅛	Dec.1, Ja.15,Q	0.75
Mason Valley	N. Y. Curb	1⅜	1⅛	1⅛	...	...
Mass Consolidated	Boston	...	...	*50	Nov., 1917	1.00
Miami Copper	New York	16	15⅜	15⅛	Fe.1, Fe. 15	Q 0.37½
Mohawk	Boston	40	38⅛	38⅛	Ja.29, Ma.1	Q 1.00
Mother Lode Coa.	New York	4⅜	4⅛	4⅜	De.10, De.31	SA 0.37½
Nevada Consol.	New York	14⅜	14⅛	14⅜	De.15, De.31	Q 0.37½
New Cornelia	Boston	23	22⅞	22⅞	Fe.4, Fe.21	Q 0.50
Noranda	N. Y. Curb	21⅛	19⅞	19⅞	...	...
North Butte	Boston	3⅛	2⅞	3	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*48	*45	*45	Se. 1, Se. 15	0.03
Old Dominion	Boston	13⅛	13	13	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†130	†127	...	De.24, Ja.3	Q 1.50
Quincy	Boston	16⅛	16	16	Mar., 1920	1.00
Ray Consolidated	New York	15⅞	15	15⅛	Ap.20, Ap.30	0.25
St. Mary's Min. Ld.	Boston	24⅛	23⅛	23⅛	May, 1926	2.00
Seneca Copper	New York	3⅜	3⅜	3⅜	...	...
Shannon	Boston	...	...	*25	Nov., 1917	0.25
Shattuck-Denn	Boston Curb	5¼	5⅛	5⅛	...	...
Superior & Boston	Boston	...	...	12⅛	...	...
Tenn. C. & C.	New York	12⅛	11⅞	11⅛	No.30, De.15, Q	0.25
United Verde Ex.	N. Y. Curb	23	22⅛	22⅛	Ja. 6, Fe. 1	0.75
Utah Copper	New York	113⅛	113⅛	113⅛	De.15,De.31	Q 1.50
Utah Metal & T.	Boston	1⅜	1⅛	1⅛	Dec., 1917	0.30
Victoria	Boston	...	...	*65	...	...
Walker Mining	Salt Lake	1.15	*96	*96	...	...
NICKEL-COPPER						
Internat. Nickel	New York	40¼	39⅛	40	De.16, De.31,	Q 0.50
Internat. Nickel, pfd.	New York	...	...	106	Ja. 13, Fe.1,	Q 1.50
LEAD						
Gladstone Mtn.	Spokane	*28	*27½	*28	Ja. 1927	0.005
National Lead	New York	164½	160	162	De.10, De.31	Q 2.00
National Lead pfd.	New York	...	...	118	No.19,De.15	Q 1.75
St. Joseph Lead	New York	41⅜	41	41⅜	Jn.10,Jn.20,	QX 0.75
ZINC						
Am. Z. L. & S.	New York	9⅜	8⅜	8⅛	May, 1917	1.00
Am. Z. L. & S, pfd.	New York	46	44	45⅜	Nov., 1920	1.50
Butte C. & Z.	New York	4⅜	4	4⅛	De.9, De.24	0.50
Butte & Superior	New York	11	10⅛	10⅜	De.9, De.24	Q 0.50
Callahan Zn-Ld	New York	2⅛	1⅞	2	Dec., 1920	0.50
Eagle-Picher	Cincinnati	27⅛	26⅛	26½	No.15, De.1	Q 0.40
Eagle-Picher, pfd.	Cincinnati	...	...	100	De.31, Ja.15	Q 1.50
New Jersey Zn.	N. Y. Curb	185¾	184	185	Ja.20, Fe.10	Q 2.00
United Zinc	N. Y. Curb	...	...	55	...	...
Yellow Pine	Los Angeles	*27½	*25	*25	Dec. 1925	Q 0.04
GOLD						
Alaska Juneau	New York	1⅛	1⅛	1⅛	...	...
Argonaut	Toronto	*47	*42½	*43	...	...
Barry-Hollinger	Toronto	*90	*83⅓	*84	...	...
Carson Hill	Boston	*12	*12	*12	...	...
Consol. W. Dome L.	Toronto	*16	*14	*15	...	...
Cresson Consol. G.	N. Y. Curb	2⅛	2⅛	2⅛	De.31, Ja.10	Q 0.10
Crown Reserve	Toronto	*10	*8⅛	*9⅛	Jan., 1917	0.05
Dome Mines	New York	9⅞	9⅛	9⅛	De.31, Ja.30,	Q 0.50
Golden Center	N. Y. Curb	1⅛	1⅛	1⅛	...	...
Golden Cycle	Colo Springs	†1.76	†1.75	....	No.30, De.10	Q 0.04
Hollinger Consol.	Toronto	20.30	20 10	20.25	Ja.12, Ja.28	0.10
Homestake Mining	New York	60	60	60	Ja.20,Ja.25	MX 1.50
Kirkland Lake	Toronto	*90	*85	*88	...	...
Lake Shore	Toronto	18.25	17.50	17.50	De.2,De.15	X 0.20
McIntyre-Porcupine	New York	25⅛	25⅛	25⅛	Fe.1, Ma.1	Q 0.25
Newray	Toronto	...	...	*30	...	...
Night Hawk Pen.	Toronto	*5⅛	*4⅛	*5	...	...
Portland	Colo Springs	*55	*52⅛	*52⅛	Ja.6, Ja.15, '27	0.02
Rand Mines	New York	...	...	9⅛	Au.23-30Am.Sh.	1.52
Teck-Hughes	Toronto	6.25	5.60	5 80	Ja.31, Fe. 1	0.05
Tom Reed	Los Angeles	*55	*55	*55	Dec., 1926	0.02
Tough-Oakes	Toronto	*60⅛	*58	*58½	...	...
United Eastern	N. Y. Curb	*50	*50	*50	July, 1924	0.05
United Gold	Colo. Springs	*15	*15	*15	Ja. 1, 1927	0.01
Vipond Cons.	Toronto	1.71	1.62	1.66	...	...
Wright-Hargreaves	Toronto	9.80	9.50	9.74	Ja15,Fe.1	QX 0.15
Yukon-Alaska Trust	N. Y. Curb	....	....	20	...	...
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	13⅜	13⅛	13⅛	...	...
Con. Cortez	N. Y. Curb	*8	*8	*8	...	...
Con. Virginia	San Francisco	*6½	*6½	*6½	...	...
Continental Mines	N. Y. Curb	...	...	*15	...	...
Dolores Esperanza	N. Y. Curb	...	...	*50	July, 1923	0.05
Premier Gold	N. Y. Curb	2	1⅞	2	De.17, Ja.4	Q 0.08
San Rafael	San Francisco	...	...	*28	...	...
Tonopah Belmont	N. Y. Curb	2⅛	1⅛	1⅛	Se.15, Oc.1	0.05
Tonopah Extension	N. Y. Curb	...	...	*24	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	3⅛	3⅛	3⅛	Se.30, Oc.21	SA 0.07½
West End Consol.	N. Y. Curb	*9	*9	*9	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*40	*40	*40	June, 1918	0.02

Stock	Exch.	High	Low	Last		Last Div.
SILVER						
Beaver Consol	Toronto	*68	*66	*68	May. 1920	0.03
Canadian Lorrain	Toronto	*69	*59	*67½	...	...
Castle-Trethewey	Toronto	1.18	1.03	1.17	...	...
Coniagas	Toronto	4.15	4.00	4.00	May, 1924	0.12½
Keeley	Toronto	1.61	1.51	1.61	Se. 1, Se.15	SA 0.12
Kerr Lake	N. Y. Curb	*80	*80	*80	Oc. 1, Oc 15	SA 0.12½
La Rose	Toronto	*10	*10	*10	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	...	...	*55	July, 1925	0.05
McKinley-Dar.-Sav.	Toronto	*14	*12½	*12½	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.35	3.20	3.35	De.30, Ja.15	0.12½
Nipissing	N. Y. Curb	10⅛	9⅛	9⅛	De.31, Ja.20	Q 0.15
Temiskaming	Toronto	...	...	*7	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	4⅞	4⅝	4⅝	De.18,Ja.5,	QX 0.15
Bingham Mines	Boston	45	42⅞	42⅞	De.30, Ja 5	Q 1.00
Cardiff M. & M.	Salt Lake	*50	*40	*50	Nov., 1924	0.10
Chief Consol.	Salt Lake	3.30	2.05	2.10	Oc.10, No.1	Q 0.10
Consti'n Mng. & Mill'g	Spokane	*30	*25½	*26	...	...
Erupcion	Boston Curb	1	1	1	De.18, Ja.3,	Q 0.10
Federal M. & S.	New York	...	...	88	...	...
Federal M. & S., pfd.	New York	76⅞	75½	75½	No.24, De.15	Q 1.75
Hawthorne Mines	N. Y. Curb	*8	*6	*7	...	...
Hecla Mining	N. Y. Curb	14⅞	14½	14⅜	No.15,De.15	Q 0.50
Highland-Surprise	Spokane	*16	*12	*12	...	...
Iron King Mining	Salt Lake	*33	*24	*26	...	...
Keystone Mining	Salt Lake	*†50	*†21	...	Au.12, Au.26	0.07½
Lucky Jim	Spokane	*16½	*16	*16	...	...
Lucky Tiger-Com.	Kansas City	†7.00	†6.50	...	Dec. 20, 1926	0.12
Mammoth Mining	Salt Lake	2.60	2.47½	2.60	De.17, De.23,	Q 0.25
Marsh Mines	Spokane	2⅛	2⅛	2⅛	...	...
Park Utah	New York	6⅛	6⅛	6⅛	De.15, Ja.2	Q 0.15
Plutus Mining	Salt Lake	2.20	2.20	2.20	Ja.10, Ja.15	Q 0.10
Silver King Coal	Salt Lake	8.80	7.80	8.00	De. 16, Ja.3	0.25
Silversmith	Spokane	*35	*33⅓	*33⅓	Oc.1, Oc.10	Q 0.02
Strattons Mines	Spokane	*42	*32	*42	...	...
Sunshine M. Co.	Spokane	*46½	*43	*46½	...	...
Tamarack-Custer	Spokane	*43	*42	*42½	Sept., 1924	0.25
Tintic Standard	Salt Lake	11.00	10.87½	11.00	De.11, Ja.3	0.30
Utah-Apex	Boston	6⅜	6	6	Oc.3, Oc.15	Q 0.25
IRON						
Bethlehem Steel	New York	47	43⅜	44⅜	July, 1924	1.25
Cleveland-Cliffs Iron	Cleveland	84	74	77	Ja.15, Ja.25	Q 1.00
Colorado Fuel & Iron	New York	52⅜	48⅜	50⅜	May, 1921	0.75
Gt. North'n Iron Ore	New York	22⅜	20	21⅜	Dec.6, Dec.28	0.75
Inland Steel	New York	42⅜	41⅜	41⅜	Fe 15, Ma.1	Q 0.62½
Mesabi Iron	N. Y. Curb	...	...	*95	...	...
Replogle Steel	New York	11⅞	10⅜	10⅜	...	...
Republic I. & S.	New York	61⅜	58⅛	59	Fe.15,Ma. 1	Q 1.0
Republic I. & S. pfd.	New York	99⅛	99	99⅛	Ma.15, Ap.1	Q 1.75
Sloss-Sheffield S. & I.	New York	126	126	126	De.10, De.20	Q 1 50
Sloss-Shef. S.&I. pfd.	New York	108	108	108	De.20, Ja.3	Q 1.75½
U. S. Steel	New York	113⅜	111⅛	112⅞	Fe.28,Ma.30	Q 1.75
U. S. Steel pfd	New York	130⅜	129	129⅜	Ja.29, Fe 26,	Q 1 75
Virginia I. C. & C.	New York	45	45	45	Jan., 1924	1.500
Virginia I.C.&C.pfd	New York	...	...	60⅛	De.15, Ja.2,	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol	New York	...	...	32⅜	Ja.26, Ja.29	1.45
So. Am. Gold & P.	N. Y. Curb	3⅛	3⅛	3⅛	...	...
Alum.Co.of Amer.	N.Y.Curb	71⅛	70½	70½	...	...
Alum. Co. of Amer pf.	N.Y.Curb	102½	102	102½	De.15, Ja.15	Q 0.50
Vanadium Corp.	New York	39	38	38⅛	Fe.1, Fe.15,	Q 0.75
Patino M. & E.	N. Y. Curb	25¼	25	25	Nov. 5, 1926	5 sh.
ASBESTOS						
Asbestos Corp.	Montreal	24⅜	23½	23⅜	Jan., 1926	1.50
Asbestos Corp., pfd.	Montreal	85⅛	84½	84⅝	De.31, Ja.15,	Q 1.75
SULPHUR						
Freeport Texas	New York	41⅞	37	41⅝	Ja.15, Fe.1	Q 0.50
Texas Gulf, new	New York	52⅜	50⅞	52¼	De.1, De.15,	Q 1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	43¾	41⅜	42	Fe.18, Ma. 1,	Q 0.75
Amer. Metal pfd	New York	110½	109⅛	109⅝	Fe.19, Ma 1	Q 1 75
Amer. Sm. & Ref.	New York	138	132⅛	137⅛	Ja.14, Fe.1,	Q 2 00
Amer. Sm.&Ref.pfd.	New York	122	120½	122	Fe.4, Ma.1,	Q 1.75
Consol. M. & S.	Montreal	2.47	2.43	2.44	De.31, Ja.15	X 6 25
Federated Metals	N. Y. Curb	13⅜	13⅜	13⅜	...	...
Newmont Mining	N. Y. Curb	69⅛	68⅜	68⅜	De.31, Ja.17,	0.60
U. S. Sm. R. & M.	New York	34	33⅜	33⅜	Ja.6, Ja.15,	Q 0.87½
U. S. Sm. R.&M.pfd.	New York	47	46	47	Ja.6, Ja.15,	Q 0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED JAN. 18, 1927

Name	High	Low	Last	Date	Last Div. Amount
Aramayo Mines (25 frs.)	80/7½	75/—	80/—	Nov. 1926	5 p.c.†
British Platinum (£1)	3/—	2/6	3/—	Feb. 1925	2½ p.c.
Burma Corpn. (10 rupees)	14/10½	14/3	14/7½	Feb. 1927	6 annas*
Bwana M'Kubwa (5s)	6/10½	6/3	6/6	...	...
Camp Bird (2s)	4/3	2/9	2/9	...	...
El Oro (£1)	5/1½	4/6	4/9	Nov. 1924	2½ p.c.*
Esperansa (10s)	—/4½	—/3	—/3	...	...
Frontino & Bolivia (£1)	13/1½	11/7½	12/6	Jan. 1927	5 p.c.
Mexican Corpn. (£1)	9/4½	8/6	9/—	...	...
Mexico Mines of El Oro (£1)	16/10½	15/7½	16/3	Dec. 1926	3¾ p.c.*
N'Changa Copper Mining	19/9	17/6	18/1½	...	...
Oroville Dredging (£1)	5/1½	4/9	5/—	Dec. 1923	3¾ p.c.
Ouro Preto (£1)	2/1½	2/—	2/—	May 1925	2½ p.c.
Rhodesian Congo Border (£1)	85/—	78/9	82/6	...	...
St. John del Rey (£1)	9/10½	9/1½	9/6	June 1925	6½ p.c.
San Francisco Mines (10s)	30/6	27/9	29/—	Jan. 1927	25s.
Santa Gertrudis (£1)	15/—	14/—	14/9	Jan. 1927	3¾ p.c.
Selukwe (2s. 6d.)	11/9	11/—	11/3	April 1917	6¾ p.c.
S. Amer. Copper (2s.)	3/6	3/1½	3/3	Nov. 1917	75 p.c.
Tanganyika (£1)	51/—	45/7½	46/3	Aug. 1926	7½ p.c.
Tomboy (£1)	3/3	3/—	3/3	July 1926	10 p.c.
Union Miniere du Haut-Katanga (Brussels)	9.500	9.000	9.000	July 1926	175 (‡)

* Free of British income tax. † Swiss frs. ‡ Belgian frs.-and free of taxation